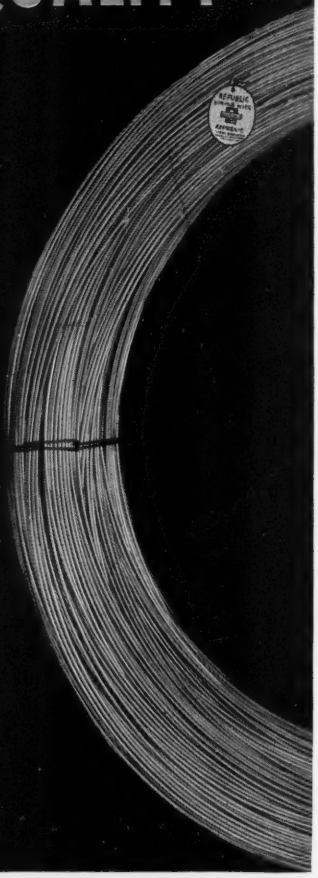
WIRE AND WIRE PRODUCTS

JUNE 1937

QUALITY



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—OTHERS SAY BECAUSE OF ITS *uniformity.*

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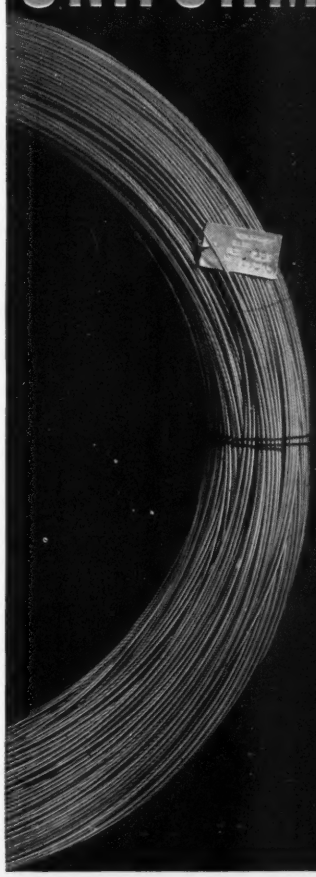
UNIFORMITY



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OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

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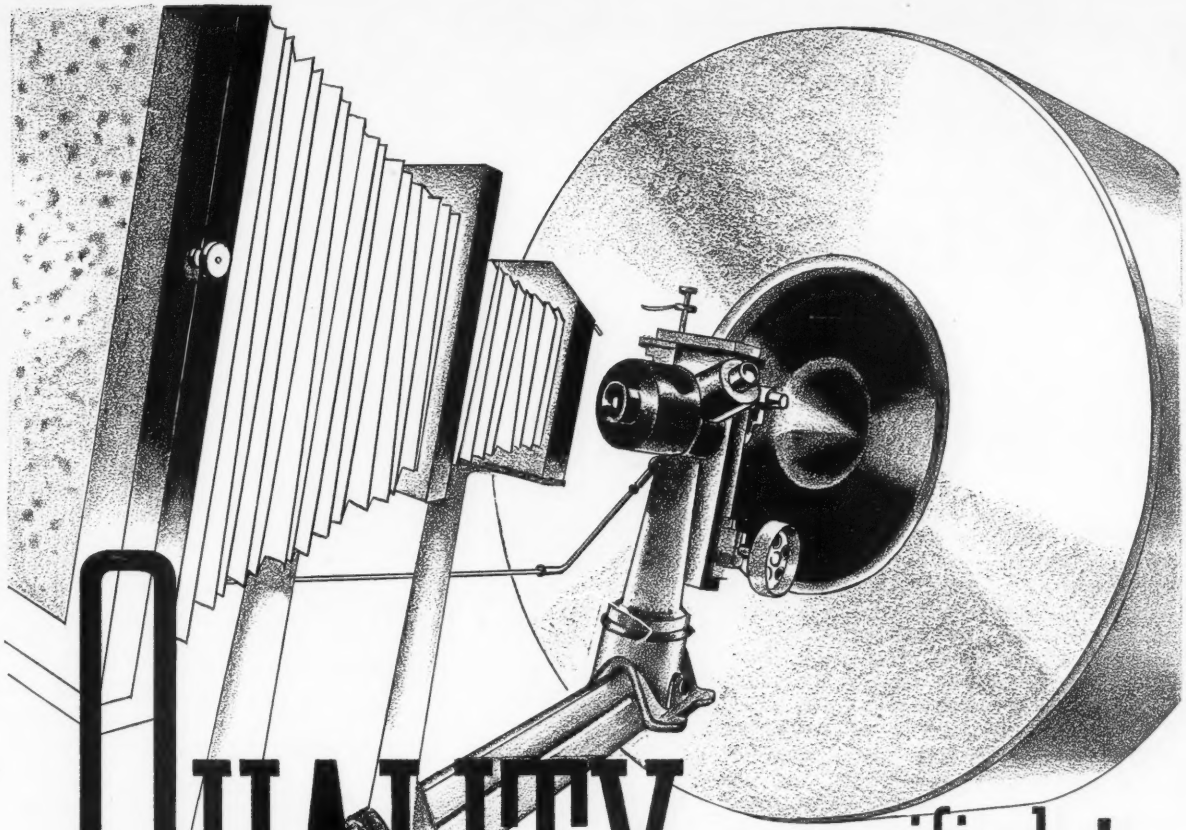

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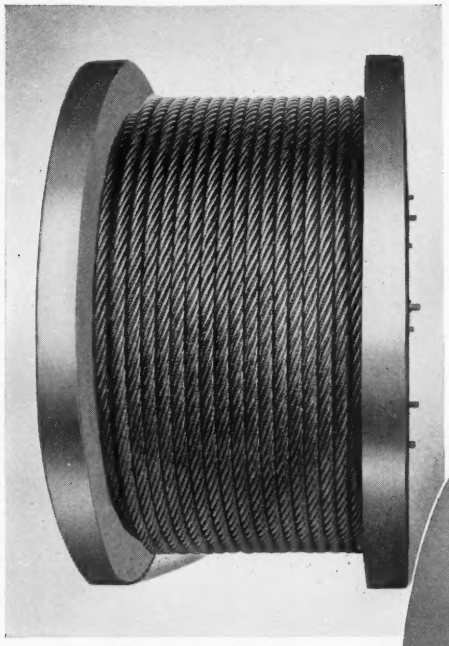
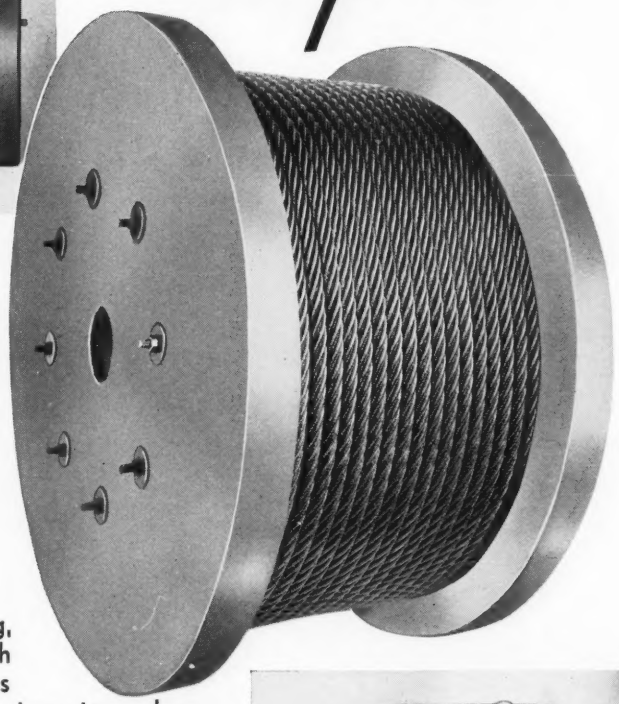


Wire Rope



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✦ ✦ ✦

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✦ ✦ ✦

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✦ ✦ ✦

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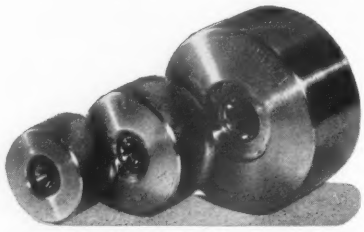
UNWIDIE

"Not a better die
but the best"



UNWIDIES

ARE YOUR DIES PROPERLY LUBRICATED?

This subject is so important that we quote in part from an article appearing in the April issue of "Metals and Alloys".

"When the oil film has broken down or when no lubricant is present, failure occurs in two principal ways, (a) by work hardening and embrittlement of the surface followed by spalling, (b) by incipient welding or seizure, the mating metals being pressed into true metallic contact, welding together locally, then being torn apart."

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip Wire Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 12 JUNE, 1937 No. 6

Designated as

Official Publication By The Wire Association

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QUALITY

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. 12 JUNE, 1937 No. 6

Aluminum Wire

By R. T. Griebling,
Aluminum Company of America,
Pittsburgh, Pa.

Methods of producing aluminum rod and wire described together with a description of the principal industries using aluminum for wire products. ✦ ✦

EIGHTY-FIVE years ago, when **Napoleon III** ascended the throne of France, a pound of aluminum cost $545. **Napoleon** commissioned the greatest scientists of his day to reduce this cost, for he was quick to realize the advantages of a light metal for military equipment. But success was not to be theirs. **Charles Martin Hall,** a young American, later discovered the process by which aluminum could be made inexpensively, and now, as a result, it sells for approximately 20 cents a pound.

✦ ✦ ✦

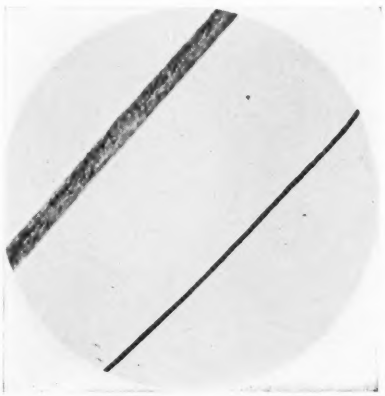
YET even today there are certain aluminum products which command a high price, not because of the metal involved, but because of the method of fabrication. One of these costs more than $163,000,000 a pound—infinitely more than the metal with which Napoleon's scientists coped! And there is a small, but steady, demand for this member of the royal family of commodities.

✦ ✦ ✦

THAT product is aluminum wire, drawn so fine that 10,000 pieces, laid side by side, would only take up an inch of space. Twenty-five of them stranded would equal the thickness of a human hair. A pound of aluminum, drawn down to this gauge, would give 108,800,000 feet of wire—almost enough to go around the equator. At a price of $1.50 a lineal foot, the pound price would be $163,200,000. It is safe to say that a whole pound has never been made.

✦ ✦ ✦

THE manufacturer of this fine wire is **Baker & Company, Inc., of Newark, New Jersey,** and the officials of this platinum and gold refining concern get many a chuckle from the stupendous figures in which they deal where fine wire is concerned. They like to tell the story of an aluminum distributor who was to have an exhibit at a metal show, and who needed a variety of aluminum samples for his booth. He heard of the wire and wanted some.



Interesting comparison between a length of aluminum wire, .0001 in. in diameter, and a brown human hair, obtained by means of a magnifying camera. The hair has a diameter of .0025 in. The two pieces have been enlarged 120 times. ✦

"Send us about a pound," he telephoned.

"Gladly," was the answer. "If you will send us a certified check for $163,200,000, we will try to make a pound of it for you in time for the show."

The distributor gasped. Prices such as these were unfamiliar to him.

"I'll take two feet of it, if you don't mind," he answered.

✦ ✦ ✦

THIS fine wire is used in string galvanometers, a type of geophysical apparatus which records the earth's tremors. The wire is supported by its ends and placed in a strong magnetic field. The current, which is generated by the earth's disturbance, passes through the wire, and the resulting motion of the wire is measured in order to obtain a record of the original earth motion. The shadow of the

wire is thrown on a moving film, and the differences of position of the photographic trace of the shadow are measured to determine the extent and the time of arrival of the shock. Lightness is the reason for using aluminum in this application.

✦ ✦ ✦

"I WOULDN'T even call it wire," said a young lady upon getting her first glimpse of a small piece. "I'd call it thread."

✦ ✦ ✦

WHILE her suggestion may have some merit, prevailing opinion is still in favor of calling it wire. Metallic thread has never had much success, at least not in the manufacture of clothing. Strong feeling against it was recorded as early as the Third Century. **Aelius Lampridius,** one of the writers of the Augustan History, says of the Emperor Severus Alexander: "He was always eager to get good linen . . . And as for inserting gold threads, he deemed it madness, since in addition to being rough, they also made the garment stiff."

✦ ✦ ✦

FINE aluminum wire is made by the **Woolaston** process, which consists of coating the metal with a copper jacket. This is done in order to draw the wire down to its ultimate fineness, for which the smallest die orifice which can be produced at present—.001 in.—is ten times larger than .0001-in. wire. Wire and jacket are drawn through the die, with the result that a coated wire with an outside diameter of .001 in. has a core diameter of .0001 in. The thickness of the copper jacket is .00045 in. Similarly, the outside diameter of a .0004-in. wire is .004 in., and the thickness of the copper jacket in this case is .0018 in.

✦ ✦ ✦

AFTER the wire is made, the copper is stripped by chemical means, leaving the bare aluminum. **Baker & Company** obtains a good core by paying attention to the conditions of the dies and to various small, but important, technical details during drawing.

✦ ✦ ✦

VERY little aluminum wire is as fine as that just described; most of it is of much heavier gauge. Aluminum wire stranded into cable around a core of stranded high-strength steel wire is commonly used for high voltage transmission lines. In the electrical industry may also be found fuse wire and wire for field coils. Fuse wire is made in all usual fuse ratings, from 1 to 300 amperes, and ranges in diameter from .0025 to .1500 in. Aluminum wire for field coil windings may be oxidized for insulation. Motor coils of square aluminum wire need no inner supporting spool, and effect savings in coil assembly weights of from 55 to 70 per cent over the usual spool-supported non-aluminum coils.

2. Various articles which are commercially made from aluminum wire. In the background is a strip of metallic cloth used in decoration. On the spool is wound some .0025 in. wire. To the right, and reading down, may be seen a spiral for an automatic pencil, a hair curling device, a bolt, a nail, an electric clock part, and two poultry leg bands. At the extreme right is a cattle tag, and in the lower foreground are a number of small aluminum rivets.

✦ ✦ ✦ ✦ ✦ ✦

ALUMINUM wire is woven into dipping baskets and drying racks in the chemical industry. Glue, gelatine, and carpet yarn are often dried on screens of aluminum to avoid metal stains on the product, for the salts of aluminum are colorless. Masons use aluminum dowels for marble sheathing, while flexible conduit is made from flattened wire. Aluminum wire, either pure or alloyed, is used in the auto-genous welding of aluminum and its alloys. Wire is also used in metal spraying equipment where it is melted and blown forcibly upon the surface to be coated.

✦ ✦ ✦

METALLIC cloths and ribbons are made of aluminum wire, as are refrigeration coils, basket weave cable armor, automatic lead pencil parts, poultry leg bands, clock parts, radio condensers, hair curlers, milk bottle carriers, toy typewriter segments, umbrella ribs, gauges, price tag clips, buttons, chain link fence, slide fasteners, transmission pole markers, oil tanker hose reinforcements, and cattle tags. Even that first large application of wire in the United States, the barbed wire fence, is now including aluminum among the metals from which it is made.

✦ ✦ ✦

ALUMINUM wire may be drawn through single dies on a draw frame, or through a series of dies on a continuous-drawing machine. The latter method is favored where a large production of pure aluminum wire is necessary. The continuous-drawing machines contain a series of rotating drums which draw the wire through a series of dies. The wire, after passing through each die, is given several turns around the drum, and the drums in the machine are so gear-

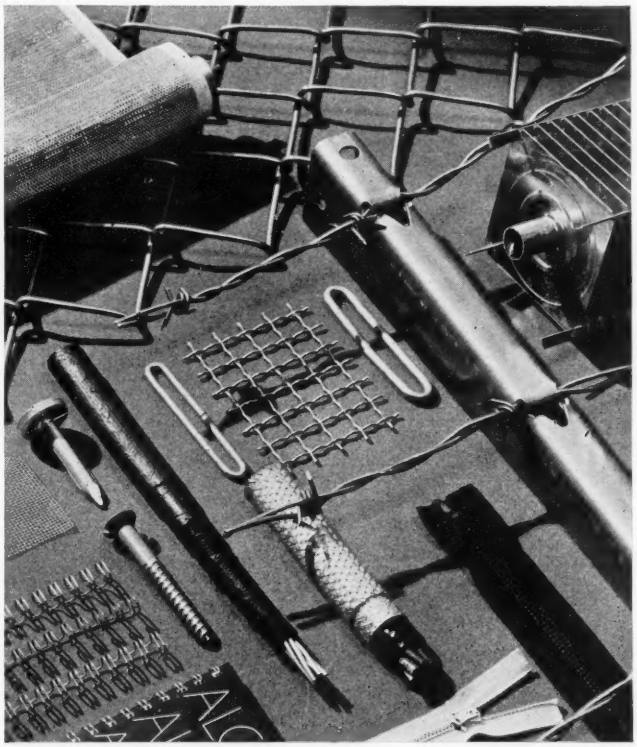
ed that each succeeding one revolves at a more rapid rate, corresponding to the increase in length of the wire resulting from a reduction of its cross-sectional area in passing through the preceding die.

✦ ✦ ✦

DIAMETERS down to .0025 in. may be obtained commercially and may be produced in both pure metal and aluminum alloys. The drawing procedure varies somewhat with the composition of the alloy. Drawing speeds as high as 4,000 feet per minute are used commercially on some alloys. Steel dies are commonly employed in drawing rod and bar, while chilled cast iron and tungsten dies are used for most wire sizes. Very fine wire is drawn through diamond dies. Thorough lubrication is essential during the drawing operations.

✦ ✦ ✦

FLATTENED wire is made by passing round wire through flattening rolls. By means of a trimming attachment, square-edged flattened wire or ribbon is produced. Square-edged ribbon of certain widths is also rolled from rectangular stock.



3. Aluminum wire has many uses. Among these may be found metallic cloth for window shades, chain link fence, barbed wire fence, hardware and screen cloth, cable, basket weave cable armor, slide fasteners—some of them tinted to match the material to which they are attached—spiral binders for books, and clips. The device shown on the extreme upper right, is a part of a refrigeration unit. The fins are aluminum, as are the corner supports and the spiral inside the center tube.

✦ ✦ ✦

RIVETS of pure aluminum and an aluminum - manganese alloy are made of half-hard wire. Strong alloy rivets require a special temper wire in the forming operation, and they are normally heat treated by the user shortly before they are applied, so that the second head may be formed with comparative ease. This is nowhere more common than in the aircraft industry, where a day's supply of rivets is heat treated at a time, then quenched, then kept in cold storage until ready for use. They must be driven within half an hour after they are taken out of cold storage, for otherwise natural hardening will set in, which the refrigeration inhibits. Rivets are naturally much easier to work before hardening.

✦ ✦ ✦

SMALLEST standard aluminum rivet is 1/16 in. long, made from wire .053 in. in diameter, and runs 29,000 pieces to the pound. Largest commercial aluminum rivet measures 3 in. in length, ¾ in. in shank diameter; seven of these make a pound.

✦ ✦ ✦

THE greatest field for the use of aluminum rivets is in the transportation industry, where they serve to join the many aluminum parts entering into the construction of airplanes, railway cars, streamlined trains, buses, and trucks. Large quantities are also used in the manufacture of cooking utensils. Tubular and semi-tubular rivets are effective fastenings for automotive brake linings.

✦ ✦ ✦

COMMON nails of aluminum are available in customary sizes from 2d to 40d, not only in the standard cross-sectional dimensions of steel nails, but also in special sizes.

✦ ✦ ✦

SCREW - MACHINE products, made from wire and rod, have had their scope of usefulness increased since the introduction of strong aluminum alloy stock. Nuts, bolts, and screws of aluminum are generally available for the assembly of aluminum structures, and innumerable small articles are machined in quantity. They include battery terminals, valves for pneumatic tires, loose leaf binder posts, grease gun parts, smoking pipe inserts, razor parts, and portable tool parts.

✦ ✦ ✦

Make Your Plans Now To Attend
THE ANNUAL WIRE ASSOCIATION MEETING AND CONVENTION
To Be Held In Association With The
NATIONAL METAL CONGRESS
At ATLANTIC CITY, N. J. OCTOBER 18th to 22nd, 1937

Employer---Employee Relationships

By Homer Sayre

National Metal Trades Association,
Chicago, Ill.

The author is an authority on the subject of labor relations and the views outlined here will be of interest to all employers of labor. The article was written prior to the approval of the Wagner Act by the Supreme Court. ✦ ✦ ✦

INDUSTRIAL relations is the most important problem confronting industry today. Do not make any mistake about that. The employer who does not take the time to give serious consideration and attention to the establishment of better employer-employee relations, which the current problem merits, is doing an injustice both to his employees and his stockholders. If a large employer he may indirectly be harming the general public.

✦ ✦ ✦

FORMERLY industrial relations involved employers and employees primarily. This problem has changed tremendously during the past few years. It is no longer confined strictly to an employer-employee relationship for it has been projected into the political arena. This has largely resulted from the changed policy of the American Federation of Labor which is now attempting to secure by legislation and governmental support the complete unionization of industry, an objective which it has never been able to accomplish by its own efforts.

✦ ✦ ✦

I SHALL, therefore, discuss my subject under two main divisions. First, I shall deal with those conditions which exist outside the plant, but which must be understood by every employer if he expects to keep his internal situation in good order; and secondly, I shall touch upon those things that apply to relationship within the plant.

✦ ✦ ✦

IN 1920 the peak of unionization was reached in the United States following the War when a total of about five million were in all the different labor organizations. Between 1920 and the passage of the NIRA there was a gradual loss in union membership. As a matter of fact the membership of the American Federation of Labor dropped from 4,078,740 in 1920 to 2,126,846 in 1933. Since that time and with all the agitation and misrepresentation which has taken place, the total membership of all the different unions in the United States probably does not exceed four million.

✦ ✦ ✦

Cause of Radical Movements

AGITATION thrives on misfortune. As a result of the disastrous effects of the depression, conditions were naturally favorable for radical movements and for union organization. Today the current problem is and for the past three years has been serious primarily because of what has been taking place outside the plant. Organized labor has attempted to utilize a national misfortune. In this endeavor, it has gained the support of many unbalanced and inexperienced theorists who have appealed to the masses on the belief that the future of this country and of industry is in jeopardy.

✦ ✦ ✦

IF the employers in the United States today were to grant all of the demands of organized labor, the union leaders would be compelled, in order to keep their membership together and hold their jobs, to make additional demands within a very short period of time, unless, as in certain parts of the coal industry, they should be successful in obtaining the check-off system whereby union dues are deducted by the employer from the workmen's salary and paid directly to the union. In other words, union membership depends upon the creation of industrial unrest.

✦ ✦ ✦

ONE of the most serious causes of present labor unrest has been the spreading broadcast of propaganda to the effect that employers' and employees' interests are antagonistic. This has been the basic philosophy behind the American Federation of Labor movement for years. Today a vast amount of funds is available for the use of irresponsible agitators to convince employees that the operation of American industrial management is harmful to their interests. The average union member pays $26.00 in dues each year. Based upon four million members this means a total yearly income at present of $104,000,000. If the approximately 26,000,000 citizens eligible to union membership were organized, it would mean a total yearly income of approximately $624,000,000.

✦ ✦ ✦

IT is only natural, therefore, that much dissatisfaction and many strikes should flow from union activities to greatly disturb normal economic recovery. It is likewise natural that there should be so much propaganda by union organizers to defeat any attempt to bring about too much cooperation and friendly dealings between management and their employees.

✦ ✦ ✦

HOWEVER, not all employees are being mislead. Some recognize the primary need of cooperation as is shown by a quotation taken from a pamphlet recently distributed by the Defense Committee of the employees of the Carnegie-Illinois Steel Corporation:

"After almost seven years of depression and misery, the worst economic depression this country has ever seen, we are now on the threshold of a new era of prosperity. Men are back at work and

can now buy not merely food and clothing, but even luxuries for their families. The same people who a short time ago were wondering almost desperately where their next meal was coming from, are now happy and smiling. There are still many problems to be solved before all of the people of this nation have what is rightfully theirs,—the right to life, liberty and pursuit of happiness. We may hope for success in these problems only so far as we are actuated by a spirit of cooperation and brotherhood. Unless this spirit is made the basis of solving our social, political and industrial problems we cannot hope to have peace and contentment.

"The employer and employes must work together for their common good. There must be a spirit of cooperation and brotherhood if both are to progress materially and socially. They must cease to regard each other as enemies, and recognize themselves as joint trustees of one of the most important elements of our natonal life. This cannot be done by our joining the Amalgamated Association of Iron, Steel and Tin Workers, because they refuse to regard themselves as partners in industry. We prefer to stick by the Employee Representation Plan, which already has produced such substantial benefits."

✦ ✦ ✦

Reasons for Present Day Strikes

TODAY strikes are occurring in many plants not because of dissatisfaction with wages and hours, but because of the attempt of the unions to secure the closed shop; a shop in which a man cannot work unless he carries a paid-up union card. The employers are not only faced with demands for the closed shop, but are also confronted with the decision as to which union shall be permitted to close their shop. In other words, shall they deal with Mr. Lewis or with Mr. Green.

✦ ✦ ✦

WE know that "recognition of the union" means the right of the union to exclude from employment those who do not belong to it and that "collective bargaining" means bargaining with the "union." Unfortunately, however, these terms are not understood by the public.

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WE know that during the depression most employers did everything that they could to keep their employees working by spreading the work and by manufacturing their staple products in anticipation of orders for the future. As a result many firms willingly suffered severe loss in reserves. During this period the union leaders confined themselves principally to open criticism of the employers. However, with the pick-up in business when the opportunity was given the employee to earn a full week's pay, the organizers characteristically became active in fomenting trouble for the purpose of building up their organizations. As a result the employers of the country have been and are now confronted with individual and sympathetic strikes which threaten not only their business, but the livelihood of thousands of their employees. The situation is further complicated by the breakdown of law and order in many localities and by the introduction of the so-called "sit-down" strike. At the present time the chief defense against the "sit-down" strike is for the employer to refuse to have any negotiations with the strikers until they leave the plant.

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Solution Suggested

THOUSANDS of employees are today involved in controversies to which they are not a direct party. The only solution is to make the general and sympathetic strike illegal, and to make the labor unions liable for their acts and accountable to their membership for the tremendous funds which they accumulate and spend. I have arrived at this decision with great reluctance because I have always been opposed to projecting the problem of industrial relations into the political field, and because I have felt that we already have sufficient laws to cope with violence and unlawful acts if enforced. I believe, however, that the necessity of the situation makes a change in this policy desirable and that legislation should be enacted in the various states whereby through court action unions and their funds can be reached directly by any party whom they have unlawfully injured.

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Employer's Responsibility

IF an employer is to deal properly with his employee relationships within the plant, he must learn and carefully consider the employees' point of view so that he can intelligently meet and adjust those factors which adversely affect employment conditions. On many occasions I have pointed out that I feel employees are primarily interested in three things:

a. A steady job, under good working conditions;

b. A fair wage which will permit a reasonable standard of living; and

c. A good boss to work for.

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UNDER such conditions employees have the peace of mind which enables them to apply themselves wholeheartedly to their tasks and produce a normal amount of work.

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OF course, employers recognize the desirability of having steady work for their employees, and they would like to provide regular employment at all times if that were possible. However, the problem is frequently beyond the control of the employer, regardless of how comprehensively he may attack it.

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NO one plan, practice, or device can completely stabilize employment, but there is much that can be done to make changes in employment levels less severe. The cumulative effort of such procedures will not only help to smooth out the curve of employment in a particular industry, but will spread to other industries and will thereby serve to further stabilize business as a whole.

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What the Employee Wants to Know

EMPLOYERS should not only aim to provide steady work, but also should maintain good working conditions which include safe, sanitary, light, airy plant facilities. This is recognized as being of such importance that many employers spend large sums for these purposes.

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THE second thing which the average American workman wants to know is how much money he will receive in his pay envelope at the end of the week. This is far more important to him than the hourly rate. Furthermore, any complicated system of wage payment which will not permit him to easily calculate his daily or weekly

earnings will create dissatisfaction that may culminate in serious trouble. Every system of wage payment, whether based upon the hourly, weekly, or incentive plan, should be so safeguarded as to encourage and reward individual effort.

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AN employe is not only interested in receiving a certain wage, but he is particularly interested in how much the wage buys. In other words, it isn't how much money a man gets at the end of the week that determines his standard of living, but what he can buy with the money he receives. Therefore, the wise employer keeps posted on the changes in the cost of living and the rates of wages paid in his industry and community.

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FINALLY, the employe wants to work for a good boss. He feels more like doing his best for an employer who is sympathetic and interested in his problems and advancement, than for one who apparently has no interest in his workmen. He wants to believe that his employer is one who appreciates and understands the problems of his employes and is ready to give them advice and assistance in meeting their every day problems and in helping them to increase their earning capacity.

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EMPLOYERS of few workmen too often make the mistake of believing that because they know every employe by his first name they have no problem in the field of industrial relations and therefore they make no attempt to establish an organized program that will prevent the development of dissatisfaction. These employers should not permit sales work nor the general direction of their business to interfere with their giving adequate time and thought to the establishment and maintenance of good industrial relations. In the larger plant the owner or chief executives are compelled to depend on foremen or other subordinates to maintain a good industrial relationship between the company and the producing personnel.

Importance of Foreman

SINCE foremen are delegated such important responsibilities, they should be properly trained to discharge the several functions assigned to them. They assume too often that because they employ a man reputed to be a good tool maker or machinist that he does not need further instruction. This is far from the truth and frequently handicaps seriously the man in his attempt to secure advancement.

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THE foreman is the keystone of company relations with the employe. He is to the employer and the employe what the non-commissioned officer is to the commanding officer and private soldier—the contact between rank and file.

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IN any program for improving employer-employe relationships, the foreman is the man who can make or break it. He should be educated in the art and technique of developing employer-employe cooperation. He must know machines—the technique of his daily work—he must be given an opportunity to understand the more intimate problems of the business, and he must know men.

✦ ✦ ✦

TODAY the foreman is the natural leader of his men. He should be held responsible for determining and analyzing the reasons for employe dissatisfaction and for finding possible sources of trouble. The employe should be encouraged to take his problems to his foreman, who should if possible handle such cases then and there on the basis of merit before they develop into serious situations that affect a large percentage of the personnel. In the final analysis, however, no matter how much the employer delegates to his subordinates the carrying out of the steps which are necessary for sound industrial relations in the plant, he, himself, has to assume the responsibility for their final completion. He, therefore, should not assume that his subordinates know and will use the proper methods to maintain good industrial relations. He should study the attitudes of his men and make it a major part of his responsibility to see that, as required, preventive or corrective measures are applied.

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Cooperation is Basis of Sound Relations

THE whole program for sound employer–employe relations depends on cooperation. Cooperation is based upon so training a man, whether executive or employe, that he will automatically react in the right way to a given condition and naturally develop the proper methods for accomplishing something in coordination with his fellow employes. Cooperation, therefore, calls for an entirely different kind of discipline than that which is observed by autocratic leadership. It calls for trained employes who will know what to do and want to do it. The autocratic discipline waits upon direction. Cooperation does not require the constant supervision of task masters or drivers. The whole aim of cooperation is to develop a greater number of self-starters and self-regulators who will automatically do the right thing at the right time and in the right way and all the time.

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THE common purpose in cooperation is the good of the business and of everybody who is a part of it. Cooperation does not mean that everybody has equal authority, or that the rewards shall be equal. It should develop equality of opportunity which shall not handicap the intelligent, skilled, and competent in favor of the ignorant, unskilled, and incompetent. Each can only be rewarded in proportion to his contribution.

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COOPERATION does not require that an employer or employe change his religion, his politics, or his hard-headed demand for practical results but in some cases it may demand that he discard old fallacies, old hates, and old practices which have prevented mutual respect and confidence. Cooperation should be an evolution, gradual but persistent, in the atti-

tudes and practices of employer and employe.

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How to Develop Cooperation

NOW, assuming that we agree that cooperation is desirable, that we thoroughly understand what is meant, and that we know the principles on which it must be based, how shall we go about the development of it?

First: The employer should study his own personal attitude and that of his executive staff toward his employes and their problems.

Second: The employer should use every means to find out what the attitude of his employes really is, what they want, what their viewpoints are on company policies, methods and practices.

Third: The employer will have to be prepared to take his employes into his confidence — because true cooperation means that employer and employe work together for a common benefit.

Fourth: The employer should realize that the employe's confidence is a matter of growth and development. It requires absolute honesty, patience, good will, and thoughtful consideration, to beget confidence. The employe is an emotional human being. He answers to a tactful and courteous attitude, just like the rest of us.

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IN other words, the biggest job before management today is to show itself to its employes by fair, straightforward and honest treatment; by seeing to it that its own house is in order.

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OUR National Metals Trades Association through its Committee on Industrial Cooperation has given a great deal of thought to this subject and has written a series of bulletins which present an analysis of what each employer can do in his own plant to improve conditions in an actual plant. Each bulletin concludes with a series of searching questions which are designed to help the employer check up conditions in his own plant. I quote a few:

1. Have you a labor policy? That might sound silly, but think it over. I repeat, have you a labor policy?

2. Is there anyone among your executives charged with the job of supervising the relations between company and the employe? What kind of job is he doing? Are the complaints increasing? Are the suggestions increasing? Is the labor turnover increasing?, Are you satisfied?

3. How much of your personal time have you given during the past six months to this matter of reviewing your wages and incentives; the morale of your employes; your training of workers and supervisors; your employment methods; the recreational and social activities of the workers? Are you satisfied with that showing?

4. Do you make a practice of talking to your workers face-to-face in meetings, or to any large groups of foremen, about the problems of the business, and ask for their cooperation, suggestions or ideas? Do you prepare over your own signature personal messages to your workers, to be published in your factory papers, or to be placed on factory bulletin boards?

5. Has your wage plan as a whole promoted confidence and understanding between the worker and your executive organization—promoted a sound basis for employer-employe cooperation?

6. Are you perfectly satisfied with the manner in which your workers are selected?

7. Have you ever compared the turnover in your plant by different departments with the turnover of men in other plants in the same departments?

8. Are you satisfied with the manner in which dismissal or discharge is handled in your plants? Does it leave the discharged worker with the feeling that he at least got a square deal? Do you make any attempt to relocate a man, in another department, who, for any reason, is let out of one department?

9. Do you feel that your safety and working conditions are promoting a mere cooperative spirit among your employes?

10. What per cent of your workers have been with you, 5, 10, 15 or 20 years, or more?

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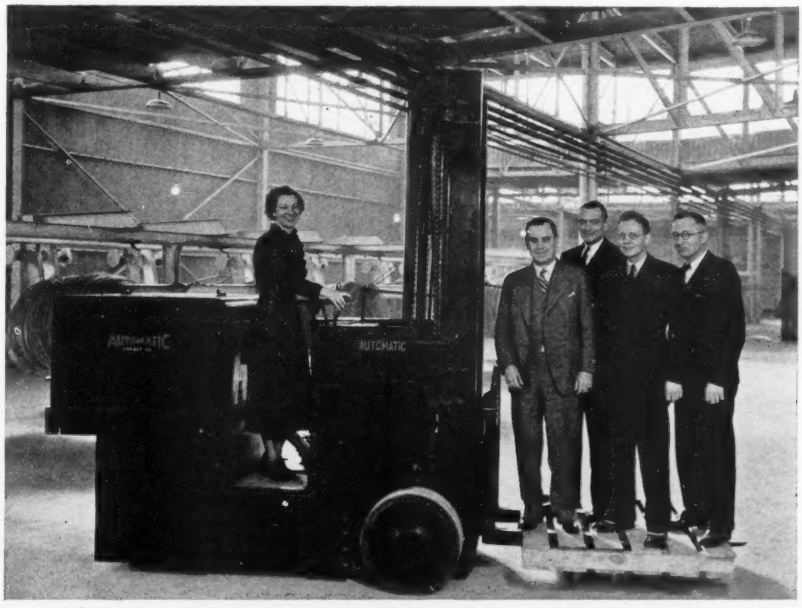
Conclusion

IN conclusion I should like to say that, in my opinion, business management stands at the crossroads of industrial relations. To the left is the way to restricted production, higher prices to the consumer, union domination, and the closed shop. The road to the right leads to increased production at lower prices culminating in a higher standard of living, and the economic freedom of the open shop with its opportunity for the development of individual initiative both among workmen and management which has played such an important part in the unusual industrial progress of this country. The employer, however, will not be able to travel this road to the right successfully even though he chooses to take it, unless he recognized the importance of selling to his own employes through fair dealings and enlightened leadership the fact that his interests and his employes' are so identical that they must move forward on this highway hand in hand. I have every confidence that if our employers do their job properly that our employes will recognize this mutuality of interest and will join with ther employers in discovering new fields of endeavor far exceeding anything that has as yet been observed in the industrial life of this nation.



Some of the boys have all the luck. Here's a picture taken recently during a salesmen's inspection tour of Republic Steel Corporation's newly completed wire mill in Chicago. The girl taking the group of men for the proverbial "ride" you might recall is none other than Sally Foster, star of the "Musical Almanac" radio program. The Republic executives being taken for the "ride" are, from left to right: J. P. Distler, Manager of Sales of the Wire Division; J. R. Fraine, Assistant Manager of Sales of the Wire Division; Earl D. Anderson, Manager of the Agricultural Extension Bureau; C. W. Ruth, Assistant Director of Advertising, Republic Steel Corp. ✦ ✦ ✦ ✦ ✦

Facts ABOUT Lindberg CYCLONE Tempering Furnace

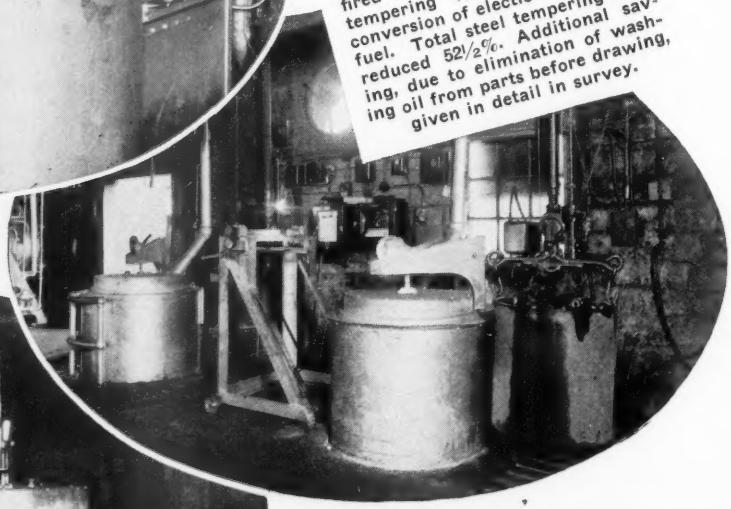
AS CERTIFIED BY INDEPENDENT SURVEYS

CASE No. LN-51-TX

Cyclone replaces former furnace for drawing chain link side plates and pins. Resultant saving in operating cost pays back investment the first year. Second Cyclone unit now installed to take place of remaining old furnace which has been scrapped. Control curves and tempering tests included in survey.

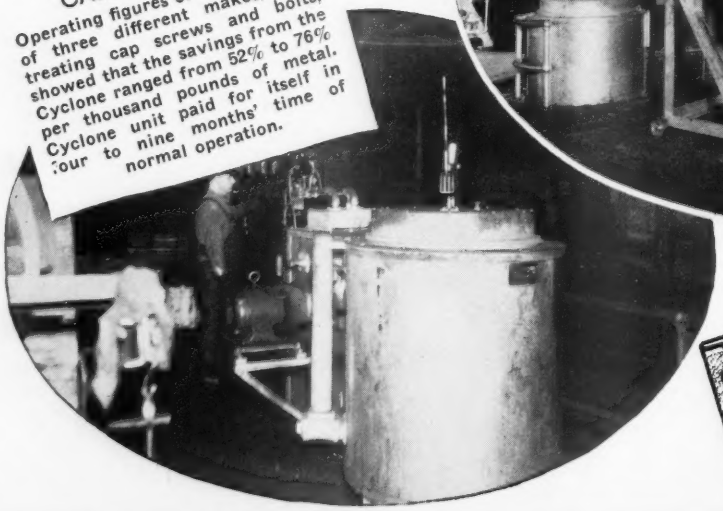
CASE No. LN-53-TX

The proved economy of a gas-fired Cyclone on butane gas, tempering forgings, results in conversion of electic unit to same fuel. Total steel tempering costs reduced 52½%. Additional saving, due to elimination of washing oil from parts before drawing, given in detail in survey.



CASE No. LN-52-TX

Operating figures of five furnaces of three different makes, heat treating cap screws and bolts, showed that the savings from the Cyclone ranged from 52% to 76% per thousand pounds of metal. Cyclone unit paid for itself in four to nine months' time of normal operation.



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Vol. 12 JUNE, 1937 No. 6

The Development of A Fatigue Testing Method For Springs and Spring Wire

By Rodman R. Tatnall

Metallurgical Engineer, Morgan Division,
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The development of a method of testing and of the machine herein described seemed necessary to establish a reliable technique for use in research work. The diagrams are useful in serving as a check on the fatigue properties of any one type of wire, to compare fatigue properties of different classes and to compare results of various treatments and practices in any one class. ✦ ✦ ✦ ✦

Introduction

FATIGUE is the failure of metal under a stress or loading which is much less than the ultimate strength of the material. Fatigue failure implies the repetition of this loading many times, the number of repetitions often running into millions before fracture occurs. It is generally understood now that this fracture starts at a point of highest stress in the metal, and spreads or progresses under the repeated loading. The point of highest stress depends on the nature of the loading, the dimensions of the object, and also on anything giving rise to stress concentration.

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FIGURE 1 shows a fatigue fracture of a helical spring. Typical fractures, such as this, show a fairly smooth portion of the broken surface which results from the working of the fractured crystals over each other, together with a portion of the fracture distinctly crystalline. This results from the fact that the fracture, or fatigue crack, progresses slowly to the point where the remaining metal can no longer support the load and an instantaneous fracture of the remaining section takes place.

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MUCH has been written on the theory and details of fatigue failures. Perhaps the best summary is given by **Moore and Kommers** (1) in their book describing various fatigue tests, procedures, and results. A great deal of work has been done, not only on the theory and mechanism of fatigue, but also on the properties and reactions of different materials. However, it is only in the last few years that any attention has been given to spring fatigue. A knowledge of the fundamentals of this work is useful as a background, but unfortunately, not many of the principles developed in this work are useful or applicable to spring problems.

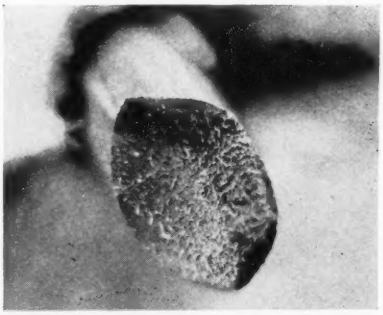

Figure 1. Typical Fatigue Fracture of Helical Spring. ✦ ✦ ✦ ✦

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Fatigue Testing in General

THERE are three distinct kinds of stress to which materials may be subjected, tensile, compressive, and shearing. In practically all applications of metal parts to machines and mechanisms, various combinations of these stresses are found. They are often very difficult to evaluate accurately, but they have a profound effect on the properties of the part. Methods of fatigue testing are in reality methods of applying a definite type of load, the amount of which can be accurately regulated, to a speci-

men a large number of times. The specimen may be of a special form to suit the particular test, or it may be a machine part in its useful shape. The type of loading may be purposely controlled to give a "pure" stress, or the loading may be such that various combinations of stress are involved, similar to the service of the part.

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TESTS in which the same stress value is reached in tension and compression are termed alternating stress tests. In bending a bar, one side is in tension and the other in compression. By bending back and forth an equal amount each side can be put into tension and compression alternately. The rotating beam gives the same stressing by bringing each fibre under the influence of the loading. Tests in which the stress is always of the same kind and in the same direction are called repeated stress tests. Automobile leaf springs work under repeated stress. Alternating stress tests may also be run in which different values are reached in tension and compression. It is customary to regard a compressive stress as having a negative sign, and a tensional stress with a positive sign. In a series of tests in which the negative stress value grows smaller and the positive stress grows larger, the mean between the two values increases from zero. When the negative stress reaches zero, the series merges into a series of repeated stress tests.

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TESTS under shearing stress are classified according to the direction of the stress. When the direction of the stress is alternately opposite, it is termed a reversed stress test. One direction is arbitrarily given the positive sign, and the other the negative. Then a series of tests can be run with increasing mean stress, and this series will merge into a repeated stress series when the negative stress reaches zero. Shearing stress tests are carried out by subjecting the material to torsion, or twisting.

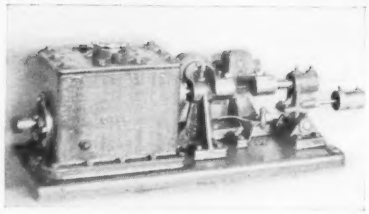

Figure 2. Fatigue Machine for Testing Wire in Torsion. (Developed at L. A. Young Spring & Wire Co.)

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THE results of fatigue tests are given in two ways. An individual test is presented by plotting the stress values against the number of cycles to cause failure. For ferrous metals, and many others, this graph becomes horizontal at some definite stress value, which is termed the endurance limit. Endurance limits found from a number of tests with various mean stress values may be plotted to give a diagram so that the results of all the tests may be seen at a glance. Figure 3 shows the S-N diagram obtained from tests in reversed torsion on an oil tempered spring wire. Figure 4 shows the result of a number of tests with varying mean stress.

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IN the case of rotating beam fatigue tests, on which most of the published work has been done, diagrams similar to Figure 4, termed **Goodman** diagrams, have been developed, and applied to derive many laws as to the behavior of materials in fatigue. In the case of springs, that is, helical extension and compression springs, application of load causes a torsional stress, and their operation is under repeated stressing.

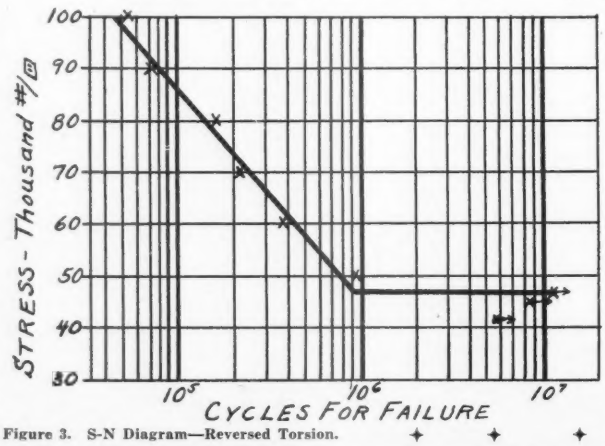

Figure 3. S-N Diagram—Reversed Torsion.

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FOR pure research work, specimens for testing are carefully machined and handled according to certain routines. However, for practical testing, the specimens should be shaped, handled, and loaded in a manner as nearly similar to service conditions as possible. The nearer the two can be kept together, the more useful will be the results. Information found by one type of test does not necessarily hold true when stresses of a different kind are applied. Many variables affecting the properties of a material, as shown in rotating beam tests, may have very much different effects in torsion tests. Carrying this thought to its conclusion, information concerning the fatigue of springs should be derived from torsion tests, and better still, from tests on springs.

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GREAT care must be taken in interpreting results of tests of complete mechanisms for the purpose of studying some one part, because many mechanical factors enter the picture and obscure the pure fatigue properties. For example, in tests of automobile valve springs assembled in the motor, results are greatly affected by vibration in the springs.

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IN many tests, the stressing is purposely made very high, and the "life" of the part taken as an indication of fatigue properties. This procedure gives false values, because life under high stress is determined by other properties, such as ductility.

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Previous Work in Wire Fatigue

H. F. MOORE (1) and his associates have published the results of a great deal of work, both

in bending fatigue, and in torsion. Their work was with carefully machined specimens, and shows for a wide variety of steels that the endurance limit in alternating stress (found by rotating beam tests) averages about 48% of the ultimate strength in tension, and the endurance limit under reversed stress, (torsion) averages about 55% of the value in alternating stress. This information is of little value applied to helical springs, because springs work under repeated stress, and these workers do not show an accurate relationship.

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WEIBEL (2) gives an excellent survey of previous work in wire fatigue, and develops a method of gripping wire specimens for pure torsion tests. He also gives test results on material handled in various ways.

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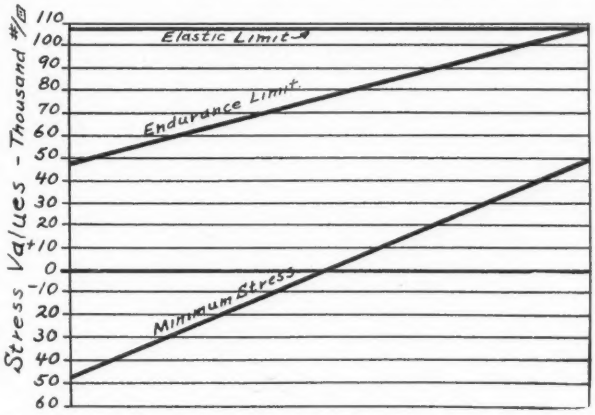

Figure. 4. "Goodman" Diagram—Torsion Tests. Oil Tempered Wire.

ZIMMERLI (3), in conjunction with the **University of Michigan,** gives results of a large number of tests run on compression springs, with a correlation between spring fatigue and other properties, in which he shows a close relation between fatigue limit and ultimate strength in torsion.

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A NUMBER of years ago, the author ran tests on wire in the torsion machine shown in Figure 2. This machine allowed variation of the loading so that tests could be run in reversed or repeated stress. A great deal of trouble was encountered with breakage in the jaws of the machine, split bushings being used to clamp the wire, thereby setting up large stress concentrations. After discarding many tests because of this jaw breakage, enough data was collected to give the graphs shown in Figures 3 and 4. Because of the wasted time and effort due to the trouble with this machine, and because it was felt that the results of these tests were not strictly comparable to spring performance, this line of work was dropped, and with these results as a guide, a better method of testing was sought.

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Development of Spring Testing Method

IT should be pointed out that the practice of running tests on complete mechanisms, that is, using the assembly as a fatigue testing machine, does not usually allow enough variation in loading to determine endurance limits, and does not allow sufficient flexibility for research work. For most practical testing, special machines must be designed.

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ZIMMERLI devised a machine for his work which tested eight springs at one time. All of his springs carried the same loading, and he considered the breakage of one spring to indicate failure under that particular stress, even though the remaining springs did not break. In this way, his tests automatically averaged minute variations in spring dimensions and characteristics of the material.

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THE machine developed by the author, now to be described was designed to test a number of extension springs, each under a different loading. Thus, each test was characteristic of the particular material, and allowed an evaluation and analysis of the variable factors affecting fatigue properties. Figure 5 shows a view of this machine.

THE machine consists essentially of a crankshaft carrying twelve cranks, each having a connecting-rod to a slide. The spring is fastened between the slide and the frame of the machine, and is extended by the motion of the crank and slide. The various throws of the crankshaft are spaced 30° apart to distribute the load caused by the springs evenly. The advantage of the crank design lies in the fact that the springs can be deflected without setting up vibration in the spring, so that operating conditions do not affect the test.

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SPRINGS to be tested are close wound, with about 20 coils total. Three coils in the center of the spring are formed to a diameter about 1/8" larger than the body. The purpose of this is to provide a part of the spring in which the stress will be slightly higher than the rest, thereby confining the fracture to a definite section of the spring. A cage, made by turning up the corners of a square plate which has been formed to fit the pitch of the spring, is screwed in between the coils on each end. A square hole punched through the center of the plate allows a carriage bolt to pass through. In this way, the spring is fastened in place by the carriage bolts to the slide at one end, and to the frame at the other. The square under the head of the bolt fitting in the hole in the plate, serves to prevent rotation of the spring, or plate, during the test. This arrangement also gives a minimum of stress concentration in holding and loading the springs, and allows adjustment of the initial loading.

✦ ✦ ✦

THE plan underlying the design of this machine was to provide a means of determining the endurance limit of springs under repeated stress. Since this determination requires several tests at various stress values, finding the highest stress at which failure does not

occur after a reasonable number of cycles, it was planned to run four springs in a series, all starting at the same minimum load and each reaching a slightly different maximum value. Then the breakage, or non-breakage, of springs would indicate the endurance limit for that minimum stress. It seemed feasible to incorporate three such series of springs in one test, and accordingly a twelve throw crankshaft was planned. To accomplish the desired result conveniently, that is, to have each spring reach a different maximum stress, it was necessary to make each crank throw slightly different from the others, because the maximum stress in this case depends on the amount of deflection given the spring together with the amount of initial loading. The amount of throw varied from 1.078″ to 1.297″ and was calculated from considerations of the dimensions of the spring and desired stressing.

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THE diameter to which the springs are coiled is chosen so that the spring index (mean diameter divided by wire diameter) is between 12 and 13. The wire diameter, of course, is determined by the material to be tested. According to the **Wahl** formula (4) the stress concentration factor for this index is between 1.10 and 1.11. Stress calculated by the usual methods is multiplied by this factor to make proper allowance for combined stresses brought about by the shape of the spring, and the factor must be applied to have true and comparable stress values.

✦ ✦ ✦

IN setting up a test, springs, plates, and bolts are assembled in the machine. With each crank set in turn to the shortest length of spring, the load corresponding to the initial stress of whatever series the spring belongs in is put on and held by adjusting nuts. These loads are measured by a spring balance applied to the holding bolts. The crank is then turned to the greatest extension of each spring, and the load measured again, to give the amount of the maximum stress. Lock nuts serve to hold the adjustments during the test, and are set up after all measurements are made. By means of the usual spring formula with the **Wahl** factor included, the stress is calculated.

✦ ✦ ✦

THIS stress formula is

$$S = k \frac{8 P D}{\pi d^3}$$

in which
S=Stress Value
k=Wahl Factor
P=Load on Spring
d=Wire Diameter
and
D=Mean Dia. of enlarged portion of spring

✦ ✦ ✦

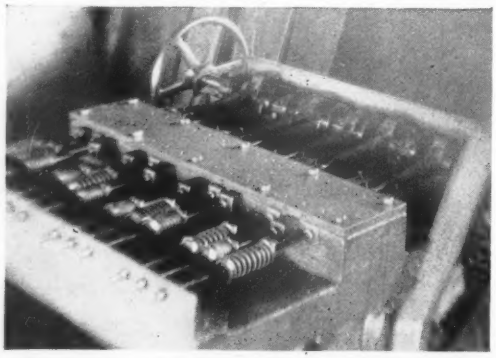

Figure 5. Fatigue Machine for Testing Helical Extension Springs.

✦ ✦ ✦ ✦ ✦

WHEN springs are set up for test, the number of active coils determines the load which will be built up by the deflection. Although allowance was made for different stresses in the throws of the crankshaft, still more variation is possible by varying the number of coils. It was planned to assemble all the springs with the same number of coils. Changing this number varies the maximum stresses of all the springs, but keeps each in the proper relation to the others in its series. It is not always possible to determine the endurance limits of a material, especially an unknown material, in one test. Other tests at lower or higher stress ranges may sometimes be required. The springs were planned to have about 10 active coils. By adding or subtracting 1 coil, the stress can be changed 8—10%. In this way, it is possible to control the stress range within quite narrow limits, since the number of active coils can be varied by half, or even quarter coils.

✦ ✦ ✦

Results Obtained With This Machine

WHEN a test is run on this machine, it is expected that some springs will break and some will not. If all the springs break, the stress values are too high, and vice-versa, if none break, the stresses are too low. For the determination of the fatigue limit, part of the springs must break, thus showing the limiting stress values. By plotting these stresses, a diagram similar to the **Goodman** diagram is obtained. The data measured and calculated for a test on this machine is given in Table 1. After the test is run, the stress values are plotted as has been done in Figure 6. Here stress values are shown by crosses (x) to show springs that broke, and circles (o) to show springs that did not break. It will be seen that a line can be drawn to divide breakage and non-breakage, and this line can be used to indicate endurance limit for minimum stress values not actually tested for. In comparing this diagram with the one shown in Figure 4, it will be noticed that this is in reality only a portion of the **Goodman** diagram. This is necessarily so, since the complete diagram represents reversed stress, and a spring can be subjected only to repeated stress.

✦ ✦ ✦

IT was expected when this machine was designed that one test, running about a week, would determine the endurance limit for the three series, and thus give an indication of the fatigue value within the useful range of the material. **Prof. Moore** states that 500,000 cycles is sufficient to determine whether or not breakage will occur, when testing hard steel. This machine is run at 350 R.P.M., giving slightly over 1 million cycles in 48 hours. In all cases to date, testing steel wires, breakage has occurred

within 500,000 cycles if at all, although many tests have been run to 5 and 6 million. There is also a very marked effect due to the amount of stress. Raising the stress by as little as 2% causes failure, when it does not occur at the lower value. In other words, a very small difference in stress magnitude marks the difference between unlimited endurance and rapid failure.

✦ ✦ ✦

Conclusion

THERE are many factors affecting the fatigue properties of a material, and there are many methods of testing for those properties. A correlation between other properties and fatigue is extremely valuable, and an understanding of the effect of the many factors in wire manufacture on fatigue properties is desirable. However, care must be exercised that, for any particular material the correlation is made along lines fitting the use of the material. The development of the machine and method of testing herein described seemed necessary, to establish a reliable technique for use in research work. The diagrams, developed comparatively easily, are useful in serving as a check on the fatigue properties of any one type of wire, to compare fatigue properties of different classes, and to compare results of various treatments and practices on any one class. In other words, the machine has been developed as a production check, as well as a research tool. It remains to carry out the work of correlating and sifting the multitude of factors in the production of springs and spring wires, so that users and designers can apply them to better advantage.

TABLE 1
DATA SHEET—SPRING FATIGUE TEST.

		Min. Load	Min. Stress	Max. Load	Max. Stress	Range
Series A—	(1)	11.1	22,200	45.6	91,000	68,800
	(2)	11.1	22,200	43.5	86,800	64,600
	(3)	11.1	22,200	42.6	85,000	62,800
	(4)	11.1	22,200	41.2	82,200	60,000
Series B—	(1)	16.7	33,300	49.6	99,000	65,700
	(2)	16.7	33,300	48.8	97,600	64,300
	(3)	16.7	33,300	48.0	95,900	62,600
	(4)	16.7	33,300	46.5	92,900	59,600
Series C—	(1)	22.2	44,400	54.1	108,000	63,600
	(2)	22.2	44,400	53.3	106,700	62,300
	(3)	22.2	44,400	51.1	102,100	57,700
	(4)	22.2	44,400	50.4	100,800	56,400

Spring O. D.—1 7/8″ Wire dia. .135″ k—1.11 10 act. coils

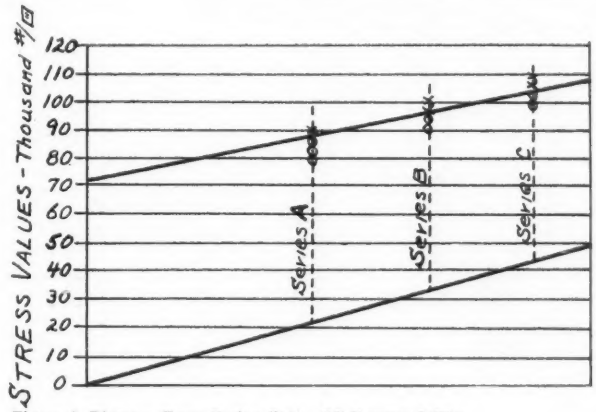

Figure 6. Diagram From Spring Test. Oil Tempered Wire.
X—Broken Springs
O—Unbroken Springs. Set up as in Table 1.

✦ ✦ ✦

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(1) H. F. Moore & J. B. Kommers
"Fatigue of Metals". McGraw-Hill 1927.

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"The Correlation of Spring Wire Bending and Torsion Fatigue Tests." Wire & Wire Products, pp 560-577, Dec. 1935.

(3) F. P. Zimmerli
"Permissible Stress Range for Small Helical Springs." Engineering Research Bulletin, No. 26, University of Michigan, July, 1934.

(4) A. M. Wahl
"Stresses in Heavy Closely-coiled Helical Springs." A. S. M. E. Vol. 51, Part 1, 1929. A. P. M. 51-17-185.

News and Notes of the Spring Industry

F. F. Barnes, President of Spring Manufacturers Association, Inc.

FULLER F. Barnes, Associated Spring Corp., Bristol, Conn., has been elected president, Spring Manufacturers Association Inc. J. W. Campbell, Cleveland Wire Spring Co., Cleveland, has been elected vice president, and L. A. Wheeler, Bristol, Conn., continues as secretary-treasurer of the association. In addition to Messrs. Barnes and Campbell, directors elected for the ensuing year are L. D. Adams, Barnes-Gibson-Raymond Inc., Detroit; A. G. Bussman, Wickwire Spencer Steel Co., New York; A. J. Hess, Chicago office, American Steel & Wire Co.; L. C. Humason, Humason Mfg. Co., Forestville, Conn; J. F. Kamen, Chicago Coil Spring Co., Chicago; E. M. Miller, Miller & Van Winkle Co., Brooklyn, N. Y., and H. F. Plagenz, Cuyahoga Spring Co., Cleveland.

Recent Literature of Interest to Spring Users

"Seventeenth Century Steel"—The Mainspring, Spring No. 6 Coil No. 12. Publication of the Wallace Barnes Co., Bristol, Conn. —A review of the state of the art of steel making three hundred years ago.

(*Please turn to Page 327*)

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5. Extruding

Vol. 12 JUNE, 1937 No. 6

Surface Seams In Rods For Cold Heading Wire

A discussion by correspondence among members of the Wire Association which will undoubtedly be of interest to all connected with the production of cold headed products. + +

Question 3025

In the production of rods for cold heading wire, in such grades as S. A. E. 1035, difficulty arises in avoiding surface seams which produce checks or cracks on a cold compression test of the rod or wire. This trouble can occur even when the billet used for rolling to the rod has been completely machined on all faces to remove every trace of surface defect, and when the machined billet, before rolling, stands a cold compression test perfectly. Would like advice as to the various factors which may cause the trouble, starting from the ingot itself and assuming that all ordinary surface seams are removed by chipping or otherwise at some stage between the ingot and the billet used for rolling the rod.

+ + +

(IN connection with this question, there seemed to be a misunderstanding on the part of several of the men replying and this was called to the attention of the member sending in the question, who further advised as follows:

+ + +

"I WISH to thank you for your letter giving replies to the question presented. I note that most of those who are presenting answers do not quite seem to have understood the question and assume that the trouble is encountered only when the wire stage has been reached or even in the cold header machine itself. I thought that my question made it plain that the difficulty was encountered on a cold compression test of the hot rolled rod. In your second letter the first reply concludes with this sentence 'This question could probably be better answered in detail by the hot mills.'

That is undoubtedly true as the problem is purely one for the rod manufacturers and the defects we are discussing are disclosed on a compression test of the hot rolled rod itself before pickling or any other processing. Perhaps with this further explanation the matter will be more clear."

WITH the additional information submitted, the following replies were received and should be considered with respect to both the original and the supplementary question as outlined above.)

+ + +

Answer No. 1

"I AM inclined to believe that in view of what your correspondent reports as to the absence of actual seams in the material, the trouble experienced may be due to actual physical hardness which is a natural characteristic of the grade of steel involved in bright drawn condition resulting in drawing directly from the as-rolled rod.

+ + +

OF course this is only a surmise on my part but there seems to have been a tendency for people to attempt to make a heading stock from these higher carbon steels without any intermediate heat treatment of the rod. At times such an attempt is met with success but more frequently difficulty is encountered in the final use of the wire. It is my personal belief that no one should attempt to make heading stock from these higher carbon grades without having previously normalized or annealed the rods and in some cases the wire should be processed or even in extreme instances spheroidized.

+ + +

OF course, these intermediate heat treatments cost money and the consumer, as a rule, will insist upon not paying commensurately for extra costs. When a customer refuses to pay a reasonable extra for this class of material in order to enable the manufacturer to process it properly it is of course better to let the other fellow take the business and keep it until he gets tired of expending more money than he is justified in spending."

+ + +

Answer No. 2

(FROM same party sending in Answer No. 1 but after receiving supplementary question) "Replying to your letter, I would say that I interpreted your former letter to apply to the behavior of the finished wire in the header and my letter to you of the sixth was predicated on that interpretation.

+ + +

HOWEVER, I am at a loss to be able to explain a condition as described in your second letter unless your correspondent is expecting the hot rolled rod to stand more of an upset test than it can be expected to withstand. If you or your friends desire to do so, I would be very glad indeed to look over any test specimens which you may care to forward to me for inspection. Possibly if I can see the specimens I might be of some further help. In case any specimens are sent, I would like to have freshly made tests in order that the cracking may not have been discolored by dirt or rusting."

+ + +

Answer No. 3

"WE have your letter asking if we can supply information in connection with the question as to what are the various causes which may produce checks or cracks on cold compression of rod or wire, assuming that all ordinary surface seams are removed. The question sets forth that this steel is an S. A. E. 1035 grade.

+ + +

IT is to be assumed that the heat was normal, the ingot properly and adequately heated, properly rolled into bloom and billet, all surface defects removed from the latter, and showing satisfactory compression. It follows that

this perfect surface billet is heated in the rod mill furnace and rolled to bolt rod size. At this point compression tests taken from the rods show each to be cracked. In our experience this would be due to (1) bad heating, or (2) overfills and laps in the rolls."

✦ ✦ ✦

Answer No. 3A

(FROM same party sending in Answer No. 3 but after receiving supplementary question) "I take it that the first question was that the cracking was encountered on cold compression on hot rolled rod without further processing, and my conclusion as pointed out, was that it was due (1) to bad heating, (2) overfills or laps in the rolls, assuming that the heat had been properly made. We might be able to determine this if a sample was supplied."

✦ ✦ ✦

Answer No. 4

"ASSUMING that from the start the ingot itself is perfect, being possibly completely machined on all faces, which would remove any trace of surface defect, it would seem that the surface cracks in the wire might be caused by possibly two or three things:

First: I believe the rolling of the billet, unless extreme care is taken, might sliver the rod. Therefore, when the rod is drawn would cause surface cracks. This to the writer's mind would be the most logical cause.

✦ ✦ ✦

HOWEVER, the surface cracks might be caused also by a badly worn drawn die and improper lubrication, although I believe the latter two causes are rather questionable, and believe the surface cracks on the wire are mainly caused by the rolling operation."

✦ ✦ ✦

Answer No. 5

"MATERIAL used for cold heading, particularly in the higher carbon ranges, must be especially free from surface defects. Seams, laps or scratches showing a depth of .003″ when examined under the microscope will open up when cold headed. This is true if the diameter of the upset portion is particularly large with reference to the wire size. Therefore, in preparing the billets and the rods more than ordinary care must be given to the raw material if it is to perform satisfactorily in the cold heading operation.

✦ ✦ ✦

FROM the above question it is entirely possible that the trouble experienced is not due to surface defects but to hard material. If the material in these higher carbon ranges is finished at too low a temperature or is cooled too rapidly from the finishing temperature, sufficient hardness will be developed to cause compression cracks in the upsetting operation. These cracks usually develop around the edges of the upset and are at an angle to the upsetting pressure line. The solution, of course, is to use material of lower Brinell hardness by a normalizing or an annealing operation."

✦ ✦ ✦

Answer No. 6

"YOUR letter refers to a member's question regarding the difficulty arising from seams in such grades as SAE-1035 cold heading wire. While we will not try to explain this from a steel making standpoint, we did have considerable difficulty with this grade of steel for several years. We use very large tonnages of it in all sizes for cold upset heading work and we manufacture our own wire from wire rods, and we give these wire rods very severe cold compression tests before they are accepted.

✦ ✦ ✦

AS stated before, we did have considerable difficulty for many years, but during the past three or four years, our troubles seem to have been entirely eliminated, and the only way that this was accomplished was by working very closely with our supplier of rods, in an endeavor to iron out each separate difficulty as it occurred, as in our opinion in this grade of steel there are many reasons why the rods would contain seams and after summing it all up, in our opinion it is just a case of keeping continually after the supplier to impress upon him that the quality must be 100% so that in the manufacturing processes, all the way from the making of the steel to the finished rods, the manufacturer will not overlook any possibility of letting anything slip that would cause seams in the finished material."

✦ ✦ ✦

Answer No. 7

"IN reply to your question, the trouble probably comes from internal seams which are the result of inclusions or internal blow holes with oxidized walls and which do not weld up in rolling. This question could probably be better answered in detail by the hot mills."

✦ ✦ ✦

Answer No. 8

"THE writer has given study to the question sent to him asking for information on how seams may be avoided in preparing cold heading wire of such grades as SAE No. 1035.

✦ ✦ ✦

THE care with which the billets have been prepared, as described by the author of the question, would in my mind limit his source of trouble to one or two causes. There is a possibility the wire has been given heavy enough draft to produce surface hardness, with the help of aging, sufficient to cause cracks as a result of upsetting. The other possibility would be that his cold header tooling may be faulty in some respects.

✦ ✦ ✦

THE first of these may be eliminated either by drawing the wire as near as possible to the time it will be used on the Header, or drawing the wire at the Header with a Hogue attachment. I might add it has been our experience that cracks developing in cold forge work such as cap screw heads have been practically unknown where the wire has been drawn at the Header.

✦ ✦ ✦

I WOULD like to suggest on the tooling, that he send us, or you procure, three or four samples of the work with which he is having difficulty, and we will be glad to inspect them and pass on what advice we feel we are able to make."

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Answer No. 9

"REFERRING to your question relating to the production of rods for cold heading wire, in such grades as S. A. E. 1035—Have duly noted compression tests have been made on the machined billet which showed no surface seams. It is conclusive then, seams are developed in the later processing.

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IN the rolling from the billet to the finished rod sizes, seams may develop due to elongated pits or overheating of billets. Suggest compression tests be made on the rough material prior to pickling for the cold drawn operation. Also compression tests should be made after the cold drawn operation. It may be possible they are over-etching in the pickling operation). The enveloping of the etching could cause seams to be set up in the extreme fibre.

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BY making the compression tests of the rough material before cold drawing, localization of the difficulty can be determined. If the over-pickling operation is causing the difficulty, a good inhibitor can be used to advantage."

✦ ✦ ✦

Answer No. 10

"Contributing Factors in the Occurrence of Seams

Open Hearth and Blooming Mill

1. Bad pouring conditions—Molten steel splashes on side of ingot mould, solidifies, and forms scabs on ingot surface. Result—slivers and seams.

2. Too high temperature results in weak crystalline structure (ingotism). Such ingots are inclined to be 'tender' and unless handled with great care, will crack or tear in bloomer. Result—seams on subsequent rolling operations.

3. Subcutaneous blow holes of sufficient size tend to oxidize in heating operations, break through the skin and form seams.

4. Hanger cracks may be caused during stripping of the mould from the ingot, resulting in subsequent seams and 'church steeples'.

5. Too rapid firing in pits cause cold ingots to crack due to too sudden expansion and seams will result in rolling.

6. Faulty manipulation in the blooming mill develops collar cuts and 'turn downs.' These, unless eliminated, will persist down to the finished product.

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Rod Mill

1. Too much stock in any one pass will result in a lap—overfill.

2. Thin edges oval will also cause laps.

3. Crossed rolls will give same effect as overfill.

4. Broken-out cores, due to non-uniform reduction during rolling, will result in seams.

5. Excessive variation in rolling temperature."

The Flow of Metals

THE above was the title of a paper presented on the occasion of the twenty-seventh Annual May Lecture before the Institute of Metals on Wednesday, May 5 in the hall of the Institution of Mechanical Engineers, London. The paper was delivered by Professor E. N. da C. Andrade, D. Sc., Ph.D., F. R. S. and Mr. W. R. Barclay, O.B.E., President of the Institute of Metals, was in the chair.

✦ ✦ ✦

FLOW is most easily observed in the liquid state, but whereas there is a satisfactory theory of gases, and the structure of crystalline solids has been elucidated by the methods of X-ray analysis, very little is known of the actual behavior of the molecules in the liquid state. It lacks the regularity of the crystal, and the molecules are too close to show the simplicity of behaviour that characterizes gases. A liquid has about the same density as a solid, and can be regarded as a solid in which the heat agitation leads to a slow movement of the molecules from their places, a molecule travelling through a distance equal to its diameter after something less than, but approaching a hundred impacts.

✦ ✦ ✦

ANDRADE has put forward a theory of liquid viscosity on the basis that the momentum is transmitted from layer to layer not, as in a gas, by the passage of molecules from one layer into the other, but by instantaneous association of the molecules when they touch, so that at any nearest approach two molecules share their momentum. On this basis a formula can be derived which gives the viscosity of a simple liquid at its melting point, and another which gives the temperature variation of the viscosity.

✦ ✦ ✦

MOLTEN metals are particularly suitable for experiments designed to throw light on this problem of viscosity, because they constitute liquids which consist of one kind of atom only, and they are not, in general, associated. The viscosity is conveniently measured by sealing up the molten metal in a sphere, suspended in vacuo, and observing the damping of the torsional oscillations of the sphere about a vertical axis due to the enclosed liquid. The method has already been used for the alkali metals, and is being extended to other metals.

✦ ✦ ✦

THE flow of solids is, perhaps, at first sight, even more troublesome theoretically than the flow of liquids, for single crystals of metals exhibit plastic flow under very small stresses, whereas a perfect crystal should firstly be strong, and secondly be brittle. Again, single crystals of metals show a very marked hardening with flow. The mechanical properties of metal crystals have been elucidated by the work of Polanyi, Schmid, G. I. Taylor and others, and it is now known that the factor which initiates plastic flow is the shear stress in a certain crystal plane and in a certain crystal direction, which can be found by experiment, but there is no general rule, applicable to all crystals, which enables us to decide beforehand what the plane will be, whereas the direction is always the direction in which the atoms are packed most closely. The glide direction seems to be more significant and fundamental than the glide plane.

✦ ✦ ✦

TO explain how it is that metal crystals can flow at all various workers have suggested, with different detail, that, in the ordinary crystal, places exist where the atoms are out of step, for a small distance, with their immediate neighbours, such regions being called "dislocations" by Taylor. It can be shown that quite a small shear stress will cause such a dislocation to run along, leaving the atoms in the region through which it passes advanced by one. The weakness and the flow of single crystals is explained along these lines. Other internal flaws have been involved to explain the time factor in the flow, and the hardening. It cannot be said that there is any fully satisfactory theory of the flow of single crystals of metals, but a good beginning has been made.

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IT is, of course, a far step from the single metal crystal to the polycrystalline metal of industry, but we can see that any crystal boundary is likely to stop the propagation of a dislocation, or guide in general, and so will make the metal less weak and less liable to flow. Industry cannot, of course, wait for theory, but the only really satisfactory way to approach the problem of the strength of metals is by way of the single crystal.

American Steel and Wire Co. to Rehabilitate Cuyahoga Works

AMERICAN Steel & Wire Company will spend $4,000,000 for rearrangement and rehabilitation of facilities at its Cuyahoga Works, it was announced recently by C. F. Blackmer, President. The principal output at Cuyahoga Plant consists of rods, wire, cold rolled strip and stainless steel. The Cold Roll Department is the one which will be improved under the present appropriation.

WHILE the program does not call for a great deal of expansion it will, however, modernize the mill through introduction of more economical methods of production and handling, scrapping of old equipment and installation of the most modern machinery for this type of work. The present cold rolling equipment comprises 114 roll stands of which 96 are single machines and 18 stands are in five train sets. It will be necessary to remodel some of this equipment, scrap some, and add a few additional machines. When the program is accomplished the plant will have somewhat greater capacity than was available previously. It is hoped that the work will be completed within a year. One of the chief changes in the cold rolling equipment will be the removal of 36 stands now on the second floor to a new location on the first floor. The second story will then be used for locker and wash room facilities and improved plant offices.

(*Please turn to Page 321*)

Outstanding Personalities of the Wire Industry

William A. Purtell, Elected President of The Billings and Spencer Company

AT the annual organization meeting of The Billings & Spencer Company held at the Hartford Club Monday, February 15, 1937, W. A. Purtell was elected president and will actively manage the affairs of the Company. Mr. Frederick C. Billings, who has been president of the Company for many years, was elected chairman of the board. Mr. Billings will continue his active interest in the affairs of the Company. The other officers were re-elected as follows: W. Roy Moore, Vice-President and Gen. Mgr.; Howard E. Oberg, Vice-President, and M. Michman, Secretary-Treasurer.

✦ ✦ ✦

MR. PURTELL, the new president, is also president of The Holo-Krome Screw Corporation of Hartford, Connecticut, manufacturers of FIBRO FORGED Socket Screws. In his new capacity as president of The Billings & Spencer Company, Mr. Purtell will not relinquish any of his duties at the Holo-Krome Screw Corporation, but will continue as president and general manager of The Holo-Krome Screw Corporation also.

✦ ✦ ✦

HE has been active in the management of The Billings & Spencer Company for the past several months in his capacity as director and as chairman of the management committee.

✦ ✦ ✦

THE Billings & Spencer Company have enjoyed substantial increases of business, are employing a force larger than they have employed for a great many years, and are now beginning to enjoy the results of the metallurgical research and sales promotional work that has been in progress for the past several months.

✦ ✦ ✦

MR. PURTELL is a member of the American Society of Metals, American Supply & Machinery Association, Rotary Club, Hartford Club and active in Veteran organizations.

✦ ✦ ✦

James Allison, New Factory Manager of Billings and Spencer

MR. JAMES ALLISON, field service metallurgist for the Union Drawn Steel Co. in New York and New England area became factory manager of Billings and Spencer Company effective March 1, 1937.

✦ ✦ ✦

MR. ALLISON has served as plant metallurgist in the Hartford, Conn., plant of Union Drawn Steel Co., worked in the open hearth department of the Crucible Steel Co., finishing mills of the Jones & Laughlin Steel Corp., American Bridge Co. and the Mesta Machine Co.

✦ ✦ ✦

HE holds AB degree from Princeton University and BS in metallurgical engineering from the Carnegie Institute of Technology. He is a member of the American Society of Metals, having served as chairman of the Hartford Chapter of the A. S. M., in 1933-34 and at present is vice-president of the Hartford Engineers Club.

✦ ✦ ✦

DURING 1932-34 Mr. Allison served on the industrial safety committee of the Hartford Chamber of Commerce and the membership committee of the Hartford Y. M. C. A. and as chairman of the sub-committee on magnetic testing he co-operated in writing an article on this subject for the Metals Handbook, a publication of the A. S. M.

✦ ✦ ✦

R. J. Southwell. Sales Manager, Campbell Division, American Chain & Cable Co., Inc.

R. J. SOUTHWELL has been appointed sales manager of Andrew C. Campbell division, American Chain & Cable Co., Inc., Bridgeport, Conn., manufacturer of Campbell abrasive cutting and milling machines and special machinery.

Republic Steel Appointments

ANNOUNCEMENT was made recently by N. J. Clarke, vice-president in charge of sales, Republic Steel Corp., of the following appointments:

✦ ✦ ✦

R. C. KLEMM has been appointed manager of sales, bolt and nut division, to succeed C. F. Newpher, who has joined the National Screw & Mfg. Co. Mr. Klemm has been with Republic Steel and its predecessor companies for 25 years.

✦ ✦ ✦

HARRY W. SCHRENK has been appointed as manager of sales, tool steel department, succeeding the late Frank J. Bauman. Mr. Schrenk has been associated with the tool steel department for a number of years.

✦ ✦ ✦

Driver Harris Personnel Changes

MR. H. O. Hartdegen has been appointed Sales Engineer of the Driver-Harris Company, Harrison, N. J., and has taken charge of the territory comprised of Northern New York State and Eastern Pennsylvania. He will also handle some accounts in the New Jersey territory. This territory was formerly assigned to Mr. J. B. Shelby who has now been advanced to the management of the Foundry division where he will act as Co-Manager with Mr. J. Sammon. Both of these men are well known throughout the trade.

✦ ✦ ✦

Westinghouse Promotes John W. White

AT a meeting of the Board of Directors of the Westinghouse Electric International Company, John W. White was elected Vice President and General Manager of the Company. He will make his headquarters in New York City.

✦ ✦ ✦

BORN in Indianapolis, Indiana, Mr. White received his early education at Randolph - Macon where he pursued an academic course and later while with West-

(*Please turn to Page 328*)

Wire Association Questions and Answers

IN the April 1937 issue we published the following question:

Question 3014

Will you please advise the writer where it is possible for us to secure a chart for the insulated wire industry, showing gauge of wire—number of strands, rubber insulation, center mills and all other data necessary in the various sizes of flexible cord?

✦ ✦ ✦

ANSWER No. 2 submitted Table A repeated herewith.

✦ ✦ ✦

Answer No. 2

"IN reply to your inquiry we tabulate in Table A the following information, showing in column 2 the normal stranding scheme with flexible cords in accordance with the sizes in column 1. The stranding schemes in columns 3 and 4 are confined to the asbestos insulation heater cord types. I have given the c.m. area of each of these sizes in column 5 and the diameter in mils in column 6.

The wire Association is for the specific purpose of improving production methods. It was organized as a clearing house of ideas on technical problems and research work in all phases of practical wire drawing and wire working.

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TABLE A

Size AW Gauge	No. Strands No. 30 bare	No. Stds. No. 32	No. Stds. No. 34	C. M. Area	Diameter In Mils
22 -	7	10	16	642	25.35
20 -	10	16	26	1022	31.96
18 -	16	26	41	1624	40.30
16 -	26	41	65	2583	50.82
14 -	41	65	104	4107	64.08
12 -	65	104		6530	80.81
10 -	104				

✦ ✦ ✦

"FOR fixture wiring a heat resistant insulation is required.

✦ ✦ ✦

"FOR drop cord and the trade normally uses a twisted pair with a 1/32" rubber and dry glazed cotton braid over each conductor.

✦ ✦ ✦

"FOR portable lamp use the industry used a twin parallel cord with either a 1/64" or 1/32" rubber over each conductor, soft dry cotton braid over each, and use a rayon braid over all.

✦ ✦ ✦

"FOR portable use the industry purchases what is known as a type P 1/32" rubber on each, or type PS 1/64" rubber insulation on each with a rubber compound over twisted pair conductor having a cotton braid on each and a dry black or soft cotton yarn over all.

✦ ✦ ✦

"THERE are also some plain rubber jacketed cords on the market having similar construction, but with 30% or 60% compound over all and no outside jacket or braid."

✦ ✦ ✦

WITH further reference to this question, Mr. Kemp Haythorne of the Acorn Insulated Wire Company of Brooklyn, New York, who originally prepared the Table suggests that the following information be added in connection with the Table:

No. 1—Table A gives a cord conductor table. These conductors are soft annealed copper—no tinning.

No. 2 Conductors are usually covered with a cotton serving as a separator to prevent rubber adhesion. Sometimes paper wrapping is the separator.

No. 3 Conductors are insulated with a wall of compound 1/64", 1/32" or 3/64" thick in code or 30% grade depending on the type and the service.

No. 4 The insulated conductor may be single or multiple in number laid up together.

No. 5 Two conductors may be laid up parallel or twisted, all other multiples are twisted.

No. 6 The insulated conductor may be plain rubber or have a braid on it of soft cotton, glazed cotton, silk, rayon, sieve twine or a compound saturated braid, for giving it weatherproof classification.

No. 7 Multiple conductors may be made up with filler cords in the valleys between the laid up conductors or not.

No. 8 Multiple conductors may be first braided and then twisted together; braided, twisted together and then braided overall or the overall may be just a plain rubber jacket or any outer rubber jacket may be covered with a braid.

No. 9 Cords conductors may be insulated with other than rubber as shown by the Underwriters tables of requirements, such as asbestos or cotton saturated with a head resistant compound.

I BELIEVE the above of value to one wanting to know more of the principles of flexible cords as all cord constructions come within the above category."

✦ ✦ ✦

Question 3018

Can you tell me if there is any published data on the cleaning, coating and drawing of "white liquor finish" Music Wire, and if so, where I may obtain this information?

✦ ✦ ✦

Answer No. 1

"IN reply to your inquiry, there is no published data on the cleaning, coating and drawing of 'white liquor finish' Music Wire.

✦ ✦ ✦

FOR this product each mill works out the detailed practice best suited to its own product and facilities. As a general proposition however, they use a tin copper finish, keep it rather light and on the last two or three drafts coat the wire in a solution of tin salts. The tin salts have to be put on steaming hot and that is what gives the almost pure white nickel plated appearing finish.

✦ ✦ ✦

THE tin salts are bought as such and used dissolved in hot water. You can also take copper sulphate and feed feathered tin into it until the color disappears and use this for the same purpose."

✦ ✦ ✦

Question 3019

We have before us a proposition to furnish high speed stranding machines for field telephone cables which make various combinations of copper and steel wires into a stranded layer.

There seems to be some difficulty in stranding this material, and in some cases the material to be stranded consists of the following:

Six tinned steel wires, 25 mm, stranded around one tinned copper wire, 25 mm.

Four tinned steel wires, 33 mm, and two tinned copper wires 33 mm, stranded around one tinned steel wire, 35 mm.

Eight tinned steel wires, 26 mm, stranded around one tinned copper wire, 44 mm.

We understand that this material is somewhat difficult to make, and that the matter of tension is very important.

What type of machinery is used in stranding field telephone cables, and what peculiarities are involved?

✦ ✦ ✦

Answer No. 1

"ANSWERING your inquiry, I feel that it is very difficult to give any

(Please turn to page 308)

Wire Association Questions and Answers

definite answer which may help your correspondent eliminate the trouble he is having unless we know more definitely what his trouble is. There are many things which might cause defective strand, particularly composite strand.

✦ ✦ ✦

OFFHAND, I would say the possible causes may be the following:

a—Improperly sized closing dies.
b—Improper location of closing dies.
c—Wrong tension; either too much or too little.
d—Uneven tension; more on some wire than on others.
e—Equipment unsuited for the job.

✦ ✦ ✦

I THINK the most satisfactory equipment for this is the Larmuth strander which is on the market and is a standard machine."

✦ ✦ ✦

Answer No. 2

"REPLYING to your inquiry, our experience in stranding field telephone cable has been restricted to the smaller seven-wire strands.

✦ ✦ ✦

THESE were all made on a Larmuth type strander, and we had great difficulty in forming a strand which would not curl up when laid out on the floor. This difficulty was overcome by having the strander perfectly balanced, having the wireways clear, and the spool tensions uniform. It was always necessary to make frequent inspections of the work during the stranding process, as we found that the operators would never keep the tensions uniform."

✦ ✦ ✦

Answer No. 3

"THIS can be done nicely on a tubular or similar type strander. The essential point is to have no preform in the wire caused by bending action in the cradle exit or where wire turns around sheave at barrel. Then use a preformer of suitable type. Copper does not need preforming but steel does in this work."

✦ ✦ ✦

Question 3020

We have had some difficulty in finding a source of supply for the following sizes of wire.

.184" Diameter x 16' long
.152" Diameter x 16' long
.228" Diameter x 16' long

These rods must be either oil tempered spring wire or music wire and must be straightened and cut to length within commercial limits.

Because these sizes are not nominal fractional sizes it will possibly be necessary for the fabricator to centerless grind them to size. So far we have been unable to find anyone who would be willing to do this work on small quantities.

Any information you can give us as to a source of supply for this material will be appreciated.

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Answer No. 1

"THIS question must refer to a special wire. I do not believe that any reliable wire manufacturer would have any trouble drawing and straightening and cutting ordinary Mild Steel Wires to the size and length required and do not think that if special quality steel is required, very much difficulty would be encountered. Of course, there is the question of quantities, and since these are not given, it more or less interferes with a definite reply to the question. However, would suggest that this party take this inquiry to a reputable wire manufacturer in his district."

✦ ✦ ✦

Answer No. 2

"WITH reference to the inquiry, we are pleased to advise that as far as we know, it is perfectly possible to make the sizes of wire mentioned. Although the sizes are slightly less than fractional dimensions, our Company could supply such wire in the Oil Tempered Spring Wire, analysis SAE-1060, without the necessity of centerless grinding. The desirability of such business depends somewhat upon quantity, but aside from this, it is perfectly possible to make these items."

✦ ✦ ✦

Answer No. 3

"WE are in receipt of your inquiry regarding .108, .152 and .228" wire to be supplied in 16 ft. lengths. The only grade that we can supply is the oil tempered wire, straightened and cut to a maximum length of 12 feet.

✦ ✦ ✦

WE are not in a position to supply a centerless ground stock, although we can hold these sizes to a variation of plus or minus .0005 commercially drawn. In the event that anything develops on this item as outlined above, it would be necessary to know the approximate carbon content required."

✦ ✦ ✦

Answer No. 4

"WE can furnish in blade oil tempered. All it means to get the size is to polish out one of our dies. Small quantities take extras on price."

✦ ✦ ✦

Answer No. 5

"WITH reference to this inquiry, this wire may be obtained from Geo. W. Prentiss & Co., Holyoke, Mass., Thompson Wire Co., 41 Mildred Avenue, Boston, Mass., and the Webb Wire Works, New Brunswick, N. J."

✦ ✦ ✦

Question 3021

We are seeking names of manufacturers of Water-cooled Moulds for casting square Copper and Copper Alloy Bars or Billets. The Bars produced would have to be approximately 3½" to 4" square with radiused corners of 54" long and alternatively 60" long. Two Bars should be cast simultaneously.

We should feel very much obliged if you would pass this enquiry on to any likely makers and ask them to quote us for the unit we are seeking. Please ask them to furnish us with all the necessary data, not omitting the water pressure needed, cost of Copper or other metal tubes, in the event of replacement being needed, cost of transport truck, and weight of Mould unit. The quoter would need to tell us also what delivery period would be required, and whether duty into England is included in price quoted.

✦ ✦ ✦

Answer No. 1

"REFERRING to your recent letter, we wish to advise that for a number of years past we have made a specialty of producing water cooled copper molds and have cast a large proportion of our refined copper production in these molds.

✦ ✦ ✦

"THE bars or billets which your English friends wish to cast are similar in dimensions to the VC wirebars which we are regularly producing and we are therefore in a position to furnish the required mold promptly. We will, therefore, appreciate it greatly if you will refer this company to us.

✦ ✦ ✦

FOR your information, we are enclosing a copy of our pamphlet on Copper Stools and Copper Castings. While this refers primarily to stools, one of our water cooled molds is shown in the photograph on page 7."

✦ ✦ ✦

Answer No. 2

"REFERRING to your inquiry in regard to water-cooled moulds for casting copper, I have no information about who makes moulds of this type. The United States Metal Company, of Carteret, N. J., and I believe the American Brass Company use water-cooled moulds of this type. You probably could get information from them."

Wire Association Questions and Answers

Answer No. 3

"WE thank you very much for your inquiry for a water cooled mold for casting square copper and copper alloy bars.

✦ ✦ ✦

IN our experience there has not yet been devised a satisfactory water cooled mold for the service described. At least we have not been successful in securing the necessary square tubing with the heavy wall required. A mold built with the casting cavity in section has not worked out well and we would not wish to offer a product which is not entirely satisfactory without the opportunity of working with it at close range."

✦ ✦ ✦

Answer No. 4

"IN our manufacturing operations we do not use any water-cooled moulds. It is my understanding that the Torrington Manufacturing Co. is in a position to furnish water-cooled moulds and have done so through various branches of the industry.

✦ ✦ ✦

I AM personally not familiar with the patent rights involved, and I understand there are foreign patents."

✦ ✦ ✦

Answer No. 5

"REPLYING to your inquiry in reference to names of manufacturers of water-cooled moulds for casting square copper and copper alloy bars or billets for an inquirer, wish to advise we know of no one in America who manufactures moulds of this type and therefore, cannot help you too much, however, as we understand it, water-cooled moulds are being used in Germany with great success.

✦ ✦ ✦

WE do nothing with the casting of square copper or copper alloys, however, at one time heard that Revere was using the water-cooled moulds."

✦ ✦ ✦

Question 3022

We are interested in the drawing of bronze welding rods from 3/8″ or 1/4″ down to smaller sizes, such as 5/16″ and 3/32″. We purchased these rods from another concern and we find that the cost of the smaller size is considerably greater than the cost of the large size, and we are wondering if we could not buy the larger sizes and draw them down to smaller gauges in our plant.

We do not, however, have much information about the drawing of bronze welding rods and we are wondering whether any of our fellow members could give us any information on this subject.

✦ ✦ ✦

Answer No. 1

IT is our experience that gauge extras are very fair and based on practical cost figures from experience.

✦ ✦ ✦

UNLESS there is a large tonnage involved, we do not believe that it would pay anyone to put in an equipment for the redrawing of wire when only the difference in gauge extras is involved."

✦ ✦ ✦

Answer No. 2

"REFERRING to the second paragraph of your member's letter requesting information about the drawing of bronze welding rods, in our experience here, the extras charged for small size rods over base sizes of rods are not high enough from a cost standpoint. We do not feel there would be any advantage for your member, in view of this situation, to attempt to buy base sizes of wire and redraw them to smaller sizes, and make any profit over the price he could buy the original small sizes for. This, of course, is only our experience and other wire manufacturers may have a different opinion."

✦ ✦ ✦

Question 3023

In figuring on the galvanizing of wire we notice in tables given by Washburn & Moen, Kent and Smoley in their engineering hand books, and various steel companies who have been figuring with us that there is some disagreement as to the density of wire, that is, feet per pound, pounds per foot, or feet per ton, etc. The various tables which we now have agree very closely on diameters, surfaces, etc. but when the question of weight in connection with length enters, the discrepancies amount to sometimes as much as 9%, in other words some of our customers will figure 9% more surface to a ton of No. 9 wire for example. Of course we can always suit our calculations to our customer's figures, but the condition seems to be unfortunate.

Naturally we are aware that the density of wire will vary somewhat according to the analysis of the steel and the physical condition. Nevertheless it should be possible to adopt certain values as standard, at least within 1%. Perhaps this has already been done, but we have not been able to discover it either by talking to various metallurgists or by reference to the current hand book of the A. S. T. M.

If you have any information on this subject, we would appreciate your forwarding it to us at once.

✦ ✦ ✦

Answer No. 1

"THE only reason for discrepancies that I can see would arise from using a different basis. Take the case of No. 12 unwiped galvanized wire where the wire must meet the 4 dip Cn SO4 test. This will require approximately .003 of zinc (on the diam.) Now for purpose of figuring superficial area are you going to use a diameter of .102 (diam. of wire as drawn) or .105, the diameter of the finished galv. wire? It makes a difference of 6% in the feet per pound. An easy method of figuring feet per lb. of steel wire is to use the formula $\frac{.375}{D2}$ ft./lb. This is accurate enough for all practical purposes and with a slide rule can be done very rapidly as follows. Set 1 on C scale over the diameter on the D scale. Read ft. lb. on B scale under .375 on A scale.

✦ ✦ ✦

THERE is another chance for error that I have seen made. Most of the tables published give figures for the W & M or B & S gage sizes but for no sizes in between. Unless a person stops to realize that feet per pound varies inversely, as the square of the diam. he assumes he can interpolate. For example size 11 (.1205) has 25.8 ft. per pound and size 12 (.1055) has 33.7. Now .113 which is just half way between in diameter does not have 29/75 ft./lb. but 29.3, which is a difference of more than 1%."

✦ ✦ ✦

Answer No. 2

"RECENTLY you submitted to us an inquiry from a member of the Wire Association who wished to know if it would be possible to adopt a standard for the density of steel wire which would be correct within one per cent.

✦ ✦ ✦

THE specific gravity of iron is given in authorative handbooks as 7.85 to 7.88. From these values the weight per cubic inch of iron may be calculated as .282 or .283 pounds. We have been using tables calculated from these values for mild and medium carbon steel and find that for given lengths the calculated weights check the actual weights to within approximately one per cent."

✦ ✦ ✦

Answer No. 3

"WE know that there is a difference in weight per unit volume between the so-called rimmed or open steel and killed steel. In the ingot form the difference in weight per unit of volume of open steels and killed steels may be as much as ten per cent. There is also a difference in the weight per unit of length of plain steel wires and certain alloy steel wires.

✦ ✦ ✦

I BELIEVE that many of the discrepencies which creep into tables for steel is due to the fact that erroneous weights per units of volume are used because most of the original weights were based on iron products rather than steel products.

✦ ✦ ✦

IN figuring tables it is usual to take the figure 489.6 lbs. per cu. ft. for steel and if this standard figure is used, no difficulties should arise."

✦ ✦ ✦

Answer No. 4

"IN regard to the enclosure in your recent letter, I advise that the density of steel wire expressed in feet per pound, pounds per foot, or feet per ton in the different published tables are probably figured from the same formula. Therefore, the discrepancies in the different tables, as mentioned by your correspondent, are due to the degree of mathematical accuracy of the formulators of the different tables.

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The formula used is:

(π D^2 x 12 x .2833 = pounds per lineal foot / 4)

D = diameter of wire.

✦ ✦ ✦

YOU probably know that there are a great many claims and counter-claims, at the present time, for different galvanizing processes and coatings, and the diversity of opinion in regard to the merits of each is so great that it is doubtful that a group of metallurgists could discuss rationally the fundamentals of galvanizing, and galvanized coatings."

✦ ✦ ✦

Answer No. 5

"I REGRET to say that I have no definite values in mind which would in any way solve the problem as regards the density of steel wire.

✦ ✦ ✦

GALVANIZING in itself is not a metallurgical problem. The fact that the zinc alloys with iron to form iron zinc alloys is about all there is to it. The manipulation of the equipment, the layout, etc., all are problems connected with galvanizing the underlying principles of which are not difficult."

✦ ✦ ✦

Answer No. 6

"WE are interested in galvanized wire as a consumer of this product but we do not do any galvanizing at our own plant.

✦ ✦ ✦

I DO not know that I can be of any assistance to the individual who is asking for information on weight of galvanized wire. Of course the weight of steel wire can be very definitely figured from the size of the wire. The only way that I can see that different companies can set up different weights for galvanized wire is that some must claim that they put a heavier coating of zinc on the wire than others. Of course zinc having a greater specific gravity than steel, if the percentage of cross-sectional area on some galvanized wire is higher in zinc and less in steel, then naturally the wire would have a greater weight. This is the only way in which I can account for the discrepancies pointed out by this individual."

✦ ✦ ✦

Answer No. 7

"I AGREE that there should not be a discrepancy amounting to 9%. We use the weights that are shown in the Bethlehem Steel Co. catalog, which I think, are standard with the A. S. T. M. We take the weight of the green wire surface before it is galvanized."

✦ ✦ ✦

Question 3015

It is my understanding that the association is in a position to advise one the source for special wire.

This wire must have certain magnetic requirements and would be similar to the wire once used by Western Electric and at present used by the American Telegraphone for a magnetic recording device.

I believe the carbon content is 1% and one kind that has been used does not have a highly polished surface like piano wire.

The size should be .010". I would appreciate any information regarding the above and where I might obtain a sample.

✦ ✦ ✦

Answer No. 1

"WITH reference to your inquiry regarding a source of supply for special wire, we are advised that the Wickwire Spencer Steel Company, 41 E. 42nd Street, New York, N. Y. can furnish this. We suggest you get in touch with Mr. L. D. Granger, Asst. to Vice-President. You might also contact George W. Prentiss & Company, Holyoke, Mass."

✦ ✦ ✦

Question 3017

For the past few months we have been using in our dry annealing of fine copper wire an atmosphere derived from partially combusted natural gas. Analysis of this atmosphere as we use it shows the following:

CO_2—8 to 10 percent.
CO—2 to 3 percent.
O—none.

While we have no difficulty in obtaining a bright anneal, we have experienced considerable trouble from the wire sticking on the spool after anneal. By injecting low pressure steam in annealing chamber in place of the atmosphere this trouble completely disappears.

We would be interested in learning from others who have tried this atmosphere whether or not we are using the best possible combination of gases, whether or not the hydrogen element has an affect or should be controlled, or any suggestion pertaining to the use of this type atmosphere.

✦ ✦ ✦

Answer No. 1

"THERE are two very vital factors on which no information is given in this inquiry, that is: temperature-time cycle of the anneal and the condition of the wire as it enters the equipment.

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SINCE the analysis of the atmosphere as given in the inquiry is in our opinion absolutely correct for the bright annealing of copper wire of this class, assuming of course that with a low CO content the hydrogen content will also be low, we feel that either the time-temperature cycle is incorrect or that the wire has large quantities of drawing compound on it as it enters the equipment. Either of these factors will appreciably influence the sticking after the anneal.

✦ ✦ ✦

IT is very conceivable that, if the drawing compound is the difficulty, when using steam there would be sufficient dilution and washing off of this compound as it enters the equipment to correct the difficulty in the case where steam is used as an atmosphere. This situation would not be present where the partially combusted gas is used as an atmosphere.

✦ ✦ ✦

WE, however, feel that undoubtedly the difficulty is due to an attempt to make the furnace equipment turn out a greater production than it should by shortening the time cycle and raising the operating temperature.

✦ ✦ ✦

IT has been our experience that on fine copper wire wound on spools or in coils it is absolutely necessary to operate at a quite low temperature, allowing a relatively long time in the equipment in order to prevent any sticking or ununiformity of product."

✦ ✦ ✦

Answer No. 2

"REFERRING to your inquiry regarding the troubles that one of the members of the Wire Association is having with his dry annealing furnace.

✦ ✦ ✦

IN the first place, the analysis he has given of his gas atmosphere indicates what to us would seem to be an excessive quantity of CO. We try to keep our atmospheres with a content of 1% or less of CO. He does not give the amount of hydrogen, if any, in his mixture. CO is a reducing agent and too large an amount would tend to make the copper brittle after annealing.

✦ ✦ ✦

AS to his getting sticky wire with his gas atmosphere and not getting sticky wire with steam, I would say that this might be due to the fact that with steam he would get a more uniform rate of heating and cooling throughout his load of copper and also throughout each individual spool. Assuming that the winding tension on the spools is alright, which would be indicated by the fact that he does not get sticky wire with steam, I would say that he might get away from the sticky condition with gas atmosphere by slowing down his rate of heating and his rate of cooling when using gas."

✦ ✦ ✦

Answer No. 3

"THE analysis of the atmosphere derived from partially combusted

Wire Association Questions and Answers

natural gases and used in connection with bright annealing of fine copper wire should be satisfactory although we feel that the CO_2 should be held to closer limits; namely 9.5 to 10 percent, and CO preferably from .8 to 1.5 percent.

✦ ✦ ✦

A GAS of this analysis is very stable and permanent, and there should be no reversible re-action between the CO_2 and CO.

✦ ✦ ✦

IN regard to the trouble experienced with sticky wire after being annealed in this atmosphere, it may be due to various reasons:

1. Too tight winding of the hard wire.
2. Slightly over-annealed.
3. Due to a re-action between inert gas and a slight amount of drawing compound still left on the wire. It is a known fact that CO_2 and CO re-act with oily compounds and polymerize them, forming a very sticky material resembling resin. The material formed by this re-action has been referred to by some organic chemist as **indene** and **sterene.** The remedy for this may be by reducing the amount of compound that may be allowed to get on the clean wire, or to reduce the amount of CO to between .8 and 1.5 percent as suggested above."

✦ ✦ ✦

Answer No. 4

"REGARDING the inquiry you have from a member of the Wire Association on the trouble he is experiencing with sticky wire when a gas atmosphere is employed, would advise that we know of no reason why there should be any trouble if the CO content of the atmosphere is decreased to not to exceed one to one and one-quarter per cent.

✦ ✦ ✦

WE have a furnace in operation producing bright annealed copper wire on spools using a controlled atmosphere, and no trouble is experienced from sticky wire. However, as mentioned above, the CO content is less than one and one-half per cent. Further, it is important that the dew point of the atmosphere gas be somewhat below the temperature of the water used in the water cooling section, if such construction is employed.

✦ ✦ ✦

IF the member wishes to get in touch with us, we will be glad to further discuss his problem with him."

✦ ✦ ✦

Question 3016

I have been reading with great interest in the January 1937 issue of your esteemed journal, the articles from the pen of Mr. J. Delmonte, S. M. on Wire and Plastic Insulation.

I was wondering whether I could obtain through the medium of your valued journal, names of any insulating machinery manufacturers for this type of insulating. Perhaps you could give me the benefit of an inquiry in your columns.

Answer No. 1

"AS this is a new insulating material and applicable in various ways, in most cases special machinery has to be designed. In some cases present insulating machines can be used.

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A DESCRIPTION of the wire or cable and some samples of the insulating material will enable any engineer familiar with this type of work to design and build required equipment. Will be glad to help if questioner gets in touch with me."

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Answer No. 2

"IN reply to your inquiry, I am glad to be able to furnish you with the information that you desire. In order to facilitate a direct reference, I am tabulating the products herewith and the method and special machinery (if any) for application to wires.

Cellulose Acetate—The chief application to wire products is in the form of an insulating varnish for the fabric coating. The fabric covering is applied in the usual manner and the cable is drawn through the impregnating medium. A large number of manufacturers can supply this material—DuPont de Nemours, Inc., Celluloid Corp., Fiberloid Corp., are typical U. S. firms. For extruded tubing of cellulose acetate about wires and bus bars—Baker Ltd. of England (manufacturers of Rhodoid) carry this process forward in production. They furnish the plastic tubing for this purpose.

Phenol Formaldehyde—This resin has only been applied to wire coverings as an impregnating agent. The future of this resin in wire products lies in the flexible coverings recently produced, somewhat different to the normally very hard and stiff resin. Bakelite Corp. in U. S. and Revolite Corp. of New Brunswick, N. J. have produced these flexible cable coverings impregnated with P. F. By impregnating the threads or using the insulating tape, the usual cable manufacturing machinery can be used to apply this coating.

Polystyrene Resin—It is a little more difficult to extrude this resin in tubes than cellulose acetate. Consequently, special machinery is required to apply the resin directly to the wire. Nordeutschen Seekabelwerke A.G. of Nirdenham (Oldenburg), Germany, manufacture this equipment. The polystyrene resins in U. S. are prepared by Paramet Chemical Corp. of Long Island City. In Europe, Dynamit A.G. of Troisdorf, in Germany, are the chief manufacturers of the resin.

Glyptal and Acrylic Resins—Glyptal is handled exclusively by the G. E. In cable application, it has been used primarily as impregnating varnish, and hence the usual cable machinery which applies the fabric covering can be used to apply impregnated fabric. Acrylic resins may be handled in cable work like the polystyrene resins. I am not acquainted with special machinery required for these resins.

Question 3024

Can you put me in touch with some individual who will be able to give particulars regarding the equipment, etc., required for the coating of welding rods.

At the present time, we are distributing a large tonnage of uncoated or bear-electrodes and we are supplying the welding rod distributors with this material, who in turn, are coating and distributing coated rods.

We find that in the near future, we may be forced into this coated rod business and for that reason, we would like to receive full particulars, formulas, etc.

Any information you may give on this subject will be greatly appreciated.

✦ ✦ ✦

Answer No. 1

"IN order to equip yourself for low cost quantity production of high quality Shielded Arc Electrodes, you must have the following information:

A. Detailed specifications and layout of coating material mixers, hydraulic press and extrusion dies, pick-up and conveying system plus drying oven. We have complete information, drawings, and specifications, etc. covering this on installations recently made for Lincoln Electric Company, Champion Rivet Company, A. O. Smith Corporation, as well as General Electric Company.

B. Complete analysis of 85 valid Shielded Arc U. S. A. Patents giving full details, such as date of issuance, legal owner, principal claims, and extent of commercial application; also Canadian status.

C. Patent status, present annual sales in U. S. A. complete quantitative coating analysis, mixing formula, necessary raw material supply sources, and detailed processing instruction plus probable legal status in Canada regarding the following American Commercial Shielded Arc Electrodes constituting over 95% of the 1936 sales:
Fleetweld No. 5, No. 6, No. 7.
General Electric No. 20, No. 22, and No. 23.
Red Devil and Blue Devil of Champion Rivet.
Una 2100.
Hollup Sure Weld.
Murrex Cresta of Metal & Thermit Corporation.
A. O. Smith Corporation latest types.

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A DEFINITE formula can be worked out for a shielded arc coating produced from Canadian raw materials and minerals, almost certain to be free from any patent claims so far as manufacture and sale in Canada is concerned, giving in the fusion metal produced with such electrodes the following physical characteristics:

Yield point—50-55,000 lbs. per square inch
Ultimate tensile—68-74,000 lbs. per square inch
Impact value Izod—35045 ft. lbs.
Corrosion resistance—Twice of hot rolled mild steel.

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Mar. 1937 and Mar. 1936
(In Gross Tons)

	MAR. 1937	FEB. 1937	MAR. 1936
Wire rods	3,057	1,680	4,042
Hoops, bands and strip steel	8,568	6,838	4,604
Plain, black or galvanized iron or steel wire	6,179	3,754	3,547
Barbed wire and woven wire fencing	3,785	2,956	2,861
Woven wire screen cloth	119	152	85
Wire rope	648	477	208
Insulated iron or steel wire and cables—see analysis below			
Other wire and manufactures	702	524	409
Wire nails	2,653	1,432	569
Tacks	26	33	31
Other nails, including staples	411	293	162
Bolts, machine screws, nuts, rivets and washers	1,002	895	540
Total, these 11 classifications	27,150	19,034	17,058

Imports of Iron and Steel Wire Into the United States
(In Gross Tons)

Concrete reinforcement bars	1,183	98	86
Hollow bars and drill steel	255	199	134
Wire rods	1,631	974	1,039
Barbed wire	1,297	920	2,032
Round iron and steel wire	595	453	331
Telephone and telegraph wire	2	.....	26
Flat wire and strip steel	332	225	218
Wire rope and strand	334	197	268
Other wire	410	279	143
Hoops and bands	2,586	2,407	1,706
Nails, tacks and staples	1,991	1,704	2,604
Bolts, nuts and rivets	92	91	15
Total, these 12 classifications	10,708	7,547	8,602

Exports of Insulated Wire and Cable, March, 1937

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Insulated iron or steel wire and cable	208,961	$ 38,889	3,091	$ 1,055
Rubber-covered wire	843,941	194,969	200,347	51,507
Copper weatherproof wire	302,075	47,371	90,839	15,779
Copper telephone cable	6,667	3,066	3,666	608
Other insulated copper wire	414,068	104,627	158,167	25,245
Nickel-chrome electric resistance wire	48,037	43,591	.....	.....
Total, these 6 classifications	1,823,749	$ 432,513	456,110	$ 94,194

Pig Iron Exports Continue Strong —All Leading Items Climb

PIG iron shipments while recording a decline from the February trade, continued at a relatively high level when 14,435 tons went forward (10,005 tons to Japan), making the aggregate shipments during the first quarter of the current year reach a total of 44,882 tons against only 497 tons in the like period of last year. In March, practically all items of export were in advance of shipments made in the corresponding month of 1936.

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Unfabricated Plate Shipments Rise —Tin Plate Also Up

AGAINST the February totals, higher shipments prevailed in 44 classifications during March with declines (practically all of an unimportant proportion) noted in 25. The outstanding increase (15,175 tons) was registered in unfabricated plate exports, followed by those in heavy rails (14,776 tons), plain shapes (9,625 tons), black steel sheets (5,150 tons), tin plate (4,452 tons), and unlined tanks (3,824 tons). The principal decline recorded (3,030 tons) occurred in shipments of fabricated plate, others of moment being in those of pig iron (2,683 tons), ingots (2,574 tons), and cast-iron pressure pipe (1,123 tons).

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Unfabricated Plate and Tin Plate Leaders

CLIMBING to the high level of 26,691 tons, unfabricated plate topped the list of March exports, the outstanding markets being Japan (9,394), Canada (3,514), Sweden (3,365), Kwantung (2,088), and Chile (967). Tin plate (23,484 tons) followed with Japan (3,396), Brazil (2,781), China (2,301), Argentina (1,455), Mexica (1,362), and Kwantung (1,355) the chief outlets in a widespread trade. Then came black steel sheets (18,368 tons widely distributed) going chiefly to Canada (6,586), Soviet Russia (3,492), Mexico (1,459), China (1,451), and Brazil (1,060). Plain shapes (16,169 tons) followed and went mostly to Canada (6,091), and Japan (3,499). Following were heavy rails (15,581 tons) with Mexico (9,762), Guatemala (2,404), and China (2,230) the chief purchasers. Pig iron (14,435 tons) ranked sixth and went chiefly to Japan (10,005), Germany (2,000), and Sweden (1,357).

✦ ✦ ✦

Canada Still Leading Individual Market

CANADA remained in March the leading individual market for American iron and steel products (excluding scrap) taking 39,144 tons made up mostly of black steel sheets (6,586), plain shapes (6,091), skelp (5,964), hot-rolled strip (3,373), cold-rolled strip (2,445), and steel bars (2,345). Next was Japan (33,916 tons) whose purchases were chiefly of pig iron (10,005) unfabricated plate (9,394), plain shapes (3,499), tin plate (3,396), steel bars (2,432), and ingots (2,226). Mexico (20,305 tons) followed in a trade chiefly of heavy rails (9,762), seamless casing and oil-line pipe (1,658), black steel sheets (1,459), tin plate (1,362), and ingots (1,120). China's total (12,426 tons) followed, the outstanding items being tin plate (2,301), heavy rails (2,230), plain shapes (1,833), black steel sheets (1,451), and unfabricated plate (1,014). Next, the Philippine Islands (8,649 tons) took chiefly galvanized steel sheets (1,411), tin plate (1,106), plain shapes (903), wire nails (798), and unfabricated plate (563). Venezuela (6,948) took mostly seamless casing and oil-line pipe (2,339), unlined tanks

(1,238), fabricated shapes (866), and cast-iron pressure pipe (417).

✦ ✦ ✦

March Imports Gain

IRON and steel (excluding scrap) imports into the United States during March amounted to 49,898 gross tons valued at $2,420,133 in registering an advance of 26 percent in quantity and 45 percent in value when compared with the February totals, and compared with 49,728 tons and $1,884,057 in March 1936. Against February imports, higher receipts were noted in 29 classifications, lower in 9, and in one item no trade occurred in either month. The outstanding gain (2,558 tons) was that registered in ferro-manganese receipts, others of moment occurring in solid and hollow bars (1,933 tons), structural shapes (91,888 tons), spiegeleisen (1,490), welded pipe (1,285 tons), and concrete reinforcement bars (1,085 tons). The outstanding decline (1,058) was recorded in imports of sponge iron, the only other one of importance being noted in rails and track material (630 tons).

✦ ✦ ✦

Pig Iron Still Leads

FROM the standpoint of tonnage, pig iron (10,720 tons continued as the leading product imported, and came chiefly from the Netherlands (4,580), British India (4,542), and Canada (1,488). Shapes (8,650 tons) ranked next and came mostly from Belgium (7,095), and France (1,463), followed by solid and hollow bars (5,413 tons) chiefly from Belgium (3,219), France (1,309), and Sweden (510). Ferro-manganese (4,108 tons) was taken principally from Norway (3,457), Canada (319), and France (196). Spiegeleisen (2,720 tons) came entirely from Canada (2,520), and Norway (200).

✦ ✦ ✦

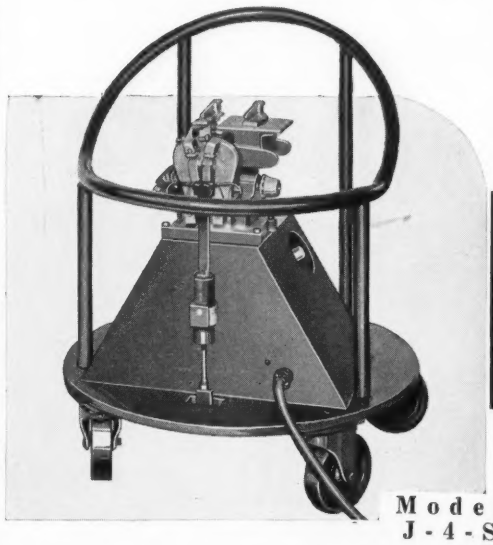
Belgium Remains Leading Supplier

BELGIUM continued in March to lead in the iron and steel (excluding scrap) import trade of the United States, sending in 16,573 tons made up chiefly of shapes (7,095), solid and hollow bars (3,219), 'other' hoops and bands (1,791), sheets, skelp, and sawplate (1,315), and concrete reinforcement bars (1,173). Germany (7,173 tons) was next in importance in a trade principally of 'other' pipe (1,758), barbed wire (1,204), welded pipe (1,089), nails (992), and rails and track material (507). Following was Canada (4,909 tons) the outstanding items being spiegeleisen (2,520), pig iron (1,488), and ferromanganese (319). The Netherlands, next, (4,651 tons) confined its trade almost entirely to pig iron (4,580), and that of British India (4,542 tons) was all of pig iron. France (3,825 tons), the sixth supplier, supplied mostly shapes (1,463), solid and hollow bars (1,309), 'other' hoops and bands (628) and ferromanganese (196).

✦ ✦ ✦

CARD CLOTHING receipts amounted to 30,982 square feet valued at $48,257 and compared with 22,690 square feet valued at $34,809 in the previous month. The chief suppliers in March were the United Kingdom (29,263 square

(*Please turn to Page 317*)



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Height to welding dies—23".

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Welding headpieces—hard bronze.

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Guard rail—protects working parts.

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General Office and Factory, Peoria, Illinois

A Review of Recent Wire Patents

No. 2,074,665, WOVEN WIRE SCREEN, Patented March 23, 1937 by Samuel H. Palmer, Portland, Oregon.

The screen is particularly adapted for use with revolving, vibrator or shaker machines and it is stated that the wearing surface of the wire screen is distributed over the greatest part of the screen.

✦ ✦ ✦

No. 2,074,713, MEANS AND METHOD OF MAKING WIRE AND THE LIKE, Patented March 23, 1937 by Ernest E. Tross, Youngstown, Ohio, assignor to United Engineering & Foundry Company, Pittsburgh, Pa., a corporation of Pennsylvania.

The claims (20 in number) include claims to an apparatus for the manufacture of wire from sheet metal or strips.

✦ ✦ ✦

No. 2,074,714, METHOD OF SIZING ROUND BARS, WIRE, TUBES AND THE LIKE, Patented March 23, 1937 by Petter B. Abramsen, Dormont, Pa., assignor of one half to Gustaf L. Fisk, Pittsburgh, Pa.

The method comprises hot rolling bar stock approximately to size, then sizing the stock by a cold pass between cross rolls acting along a spiral whose length is more than four times its diameter, and thereafter straightening the sized stock by a cold pass between cross rolls acting along a spiral whose length is about equal to its diameter.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

✦ ✦ ✦

No. 2,074,773, LEAD-HEADED NAIL, Patented March 23, 1937 by Raymond E. Camp and John J. Strysik, Joliet, Ill., assignors to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

A steel wire nail is provided with an integral head to which lead is applied to enclose the head. Extending upwardly from the head are several ribs, provided to prevent loosening or slipping of the lead portion.

✦ ✦ ✦

No. 2,074,774, LEAD-HEADED NAIL, Patented March 23, 1937 by Raymond E. Camp and John J. Strysik, Joliet, Ill., assignors to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

A lead-headed nail, somewhat similar to that just described, is provided, but instead of the ribs, the steel head of this nail is provided with a groove, functioning similarly to the ribs last mentioned.

No. 2,074,775, LEAD-HEADED NAIL, Patented March 23, 1937 by Raymond E. Camp and John J. Strysik, Joliet, Ill., assignors to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

In this form the head is rectangular and is enclosed by the lead and, because of the shape of the head, it is stated the lead portion will not slip nor loosen.

✦ ✦ ✦

No. 2,074,777, CONCENTRIC CABLE WITH MINERAL INSULATION, Patented March 23, 1937 by Marcel Marie Joseph Eugene Coupier, Paris, France.

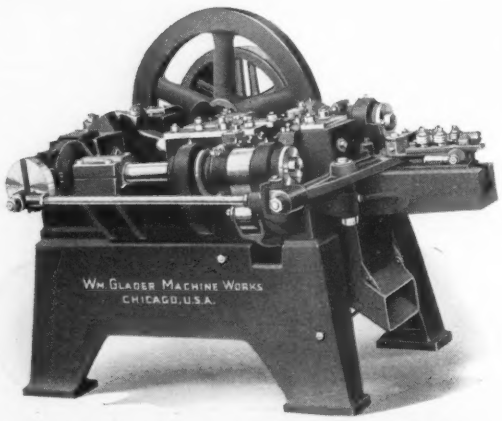
This inventor provides a mineral powder layer (preferably of magnesia) between the layers of insulation about the wire conductor.

✦ ✦ ✦

No. 2,074,789, METHOD AND APPARATUS FOR TRANSFORMING BENDABLE MATERIAL INTO PREDETERMINED AND FINISHED SHAPES, Patented March 23, 1937 by Durward K. Hopkins, Peoria, Ill., assignor to Keystone Steel & Wire Company, Peoria, Ill., a corporation of Illinois.

The method comprises in initially positioning the length in association with a support, thence subjecting the length to the action of an element com-

HIGH SPEED WIRE NAIL MACHINE



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There must be a reason.

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A Review of Recent Wire Patents

prising a former adapted upon the axial meeting thereof with the support to cause the former to divert the length of wire transversely of the former whereby the length is fashioned to assume final predetermined assemblance and finally securing certain meeting portions thereof to hold the same in finished form.

✦ ✦ ✦

No. 2,074,809, COIL HANDLING APPARATUS, Patented March 23, 1937 by George H. Rose, Cleveland, Ohio, assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

The device is provided for handling rod bundles in a rod mill.

✦ ✦ ✦

No. 2,074,826, HIGH TENSION RUBBER INSULATION, Patented March 23, 1937 by Charles R. Boggs, Waban, Mass., assignor to Simplex Wire & Cable Company, Boston, Mass., a corporation of Mass.

Vulcanized rubber insulation is provided about the wire conductor with a continuous adherent conducting covering over the insulation, this conducting covering comprising a textile base impregnated and covered with a rubber compound including graphite in proportion upwards of about 150% by weight on the rubber.

✦ ✦ ✦

No. 2,074,956, WIRE ROPE, Patented March 23, 1937 by Fred C. Carstarphen, Denver, Colo., assignor to The American Steel and Wire Company of New Jersey, a corporation of N. J.

A wire rope is provided including strands of inter-twisted wires helically laid over a core made of elastic material having grooves into which the strands are laid.

✦ ✦ ✦

Patent 2,075,826, MACHINE FOR ATTACHING WIRES TO FLORAL STICKS OR THE LIKE, Patented April 6, 1937 by John R. Nolan, Larchmont, N. Y.

This machine is adapted for winding, at the same time, a number of sticks with individual wires, all wound in the same direction.

✦ ✦ ✦

No. 2,075,168, WIRE FORMING MACHINE, Patented March 30, 1937 by David L. Brown, Summit, N. J., assignor to Trussell Manufacturing Company, Poughkeepsie, N. Y., a corporation of New York.

This machine is particularly adapted for forming the rings of ring binders.

✦ ✦ ✦

No. 2,075,996, ELECTRICAL CONDUCTOR, Patented April 6, 1937 by Maxwell E. Noyes, Mount Lebanon, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa., a corporation of Pennsylvania.

The central core of this conductor is of high tensile strength and has an outer sheath of wire having a higher electrical conductivity than the central core, the central core and wires being separated by an intermediate layer of fibrous strands.

✦ ✦ ✦

No. 2,076,041, SCREW, Patented April 6, 1937 by Ernest Payne, Chicago, Ill., assignor to Central Screw Company, Chicago, Ill., a corporation of Illinois.

A self-tapping screw is provided, the head being so formed that it will center itself in the sockets of socket wrenches without damaging or breaking the head.

✦ ✦ ✦

No. 2,086,160, STAYBOLT ASSEMBLAGE AND CAP THEREFOR, Patented April 6, 1937 by Garland P. Robinson, Glen Ridge, N. J., assignor to American Locomotive Company, New York, N. Y., a corporation of New York.

More specifically, the invention lies in the provision of a metal cap for a boiler staybolt assemblage.

✦ ✦ ✦

No. 2,076,236, SYSTEM FOR AUTOMATIC COIL WINDING MACHINES, Patented April 6, 1937 by Gilbert C. Holloway, Bloomfield, N. J., assignor, by mesne assignments, to Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania.

More specifically, the machine is especially adapted for winding the filament for incandescent lamps, the machine being of the mandrelless type.

✦ ✦ ✦

No. 2,076,237, METHOD OF AND APPARATUS FOR HANDLING STRAND

(*Please turn to Page 316*)

HERE ARE THE ANSWERS:

1. ABOUT THAT METAL TREATING "ATMOSPHERE";

or the influence exerted by the environment;

Bellislavite baths cannot injure the surface of the work or deteriorate with use, no scaling or decarburizing; a controlled heat and a controlled environment!

2. AND THE SHOP "ATMOSPHERE";

All noise, smoke, obnoxious gases, dirt and excessive heat are eliminated in the Electric Lavite Furnace.

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4. AND THE COST;

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For complete information about your requirements, write

The Bellis Heat Treating Company

Branford, Connecticut

or

Lavite Limited, Low Moor
Yorks, England

A Review of Recent Wire Patents

(*Continued from Page 315*)

MATERIAL, Patented April 6, 1937 by Helgo W. Jespersen, Western Springs, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

It is stated that this apparatus is adapted for use in conjunction with wire coating machines and is provided for taking wire strands from supply spools.

No. 2,076,356, METHOD FOR MAKING WIRE DRAWING DIES, Patented April 6, 1937 by George F. Taylor, Niskayuna, N. Y., assignor to General Electric Company, a corporation of New York.

The method comprises, for forming a wire drawing die having a die holder and nib, compressing the powdered ingredients comprising the nib within the die holder and between a plunger and non-metallic plug while the ingredients are heated to their centering temperature, the plug being provided with a central non-metallic stem extending through the die holder and having the contour desired in the finished nib, after which the plug and stem are removed.

✦ ✦ ✦

No. 2,076,667, REENFORCED FLEXIBLE ELECTRIC CABLE, Patented April 13, 1937 by James Pombo, East Providence, R. I., assignor to American Insulated Wire Corp., Providence, R. I., a corporation of Rhode Island.

The invention lies in the provision of a flexible covering for wire conductors, the coverng being made up of groups of fabric strands with spaced resilient reinforcing members overlying a selected group of the strands and extending longitudinally of the cable, and another group of strands covering these members and being interlocked to the strands of the first group between the respective members.

✦ ✦ ✦

No. 2,076,778, MECHANISM FOR WINDING WIRE FABRIC ONTO DRUMS, Patented April 13, 1937 by Noah S. Harter, Waukegan, Ill., assignor to Cyclone Fence Company, Waukegan, Ill., a corporation of Illinois.

This mechanism is adapted for employment with a weaving machine.

✦ ✦ ✦

No. 2,076,885, PRODUCTION OF RUSTLESS IRON, Patented April 13, 1937 by Alexander L. Field, Baltimore, Md., assignor, by mesne assignments, to Rustless Iron and Steel Corporation, Baltimore, Md., a corporation of Delaware.

The method comprises melting down in an electric arc furnace iron scrap together with a material rich in manganese, a material rich in chromium and an oxidizing agent, so that there is formed a bath of ferrous metal containing chromium and manganese covered by an oxidizing slag containing oxides of manganese and chromium and after meltdown is complete reducing the oxides contained in the slag so as to effect an enrichment of the bath in manganese and chromium.

✦ ✦ ✦

No. 2,077,036, SPRING STRUCTURE, Patented April 13, 1937 by William S. Brown, Carthage, Mo., assignor to Leggett and Platt Spring Bed and Manufacturing Company, Carthage, Mo., a corporation of Missouri.

To prevent the mattress from crowding down into the helical coils of the spring structure, this inventor provides X-shaped members joined together at their ends by springs.

✦ ✦ ✦

No. 2,077,243, WIRE FORMING MACHINE, Patented April 13, 1937 by Hugh Leal, Windsor, Ontario, Canada, assignor to L. A. Young Spring and Wire Corporation, Detroit, Michigan.

More specifically, the machine is adapted for forming coils with certain convolutions elongated and provided with offsets.

WIRE ASSOCIATION

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Managing Director

HAROLD E. BAGGS
Convention Manager

'Round the World With the Wire Industry

Nail Factory for Dominican Republic

ON December 12, 1936, a nail factory (equipped with German machinery) commenced operation at Ciudad Trujillo, Santo Domingo. Production capacity is stated at some 22 kegs (100 pounds each) daily. Additional machinery has been ordered which will raise the level of output to 40 kegs per day. Nail wire has been ordered from the United States and all sizes between Nos. 4 and 20 are used. This factory—at Ciudad Trujillo—is said to have made an encouraging beginning. However, there was no decline in imports in nails and tacks which during the first 11 months of 1936 were valued at $56,871 against $50,370 in the entire year 1935.

✦ ✦ ✦

German Notes

WIRE mesh purchases are heavy and prices are moving up quickly, particularly mesh of American (hard) quality. The price for a roll of 2 x 50 feet of 18 mesh advanced within 8 months from 1 to 8/2 shillings. The price for a 20 mesh of hard enamelled quality same length and width advanced from 7/10 to 10-10/6 shillings. Shipping dates have been greatly advanced.

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German Export Prices

THE following prices were paid at the end of April for wire products, all on f. o. b. basis including delivery to ports in paper £, per ton: Wire rods ¼" 10.10 (20 shillings premium above the official price). In some cases, however, 10.15 has been paid. For the Far East the price is now as before £ 12.5-12.10 c.i.f. Wire nails 12.15 (premiums 17/6 shillings); barbed wire of 12 BWG 15.0 (premiums 20 shillings); galvanized wire basis 14.0 (premiums 30 shillings); plain bright wire £ 10.15 to 11.10 (premiums 20 shillings). In spite of the fact that the IWECO has not yet resumed sales, with the exception of the release of small lots, the premiums are not as high as those for other finished steel materials. The exporters continue to turn down many orders due to the impossibility of placing the business with the manufacturers. Manufacturers of springs have advanced export prices 15% since April 1st. In spite of advanced shipping dates up to 25 weeks, the demand for cemented wire nails is still growing. This demand comes chiefly from countries where there is already a national—though young—industry producing nails in insufficient quantity or quality. The German cable and insulated wire industry reports an important increase in export orders. During the first quarter of this year export orders showed an advance of 38%. All works are paying higher dividends. International competition in these products is much smaller, particularly as Japan is now competing only in telegraph cables and leaves the business for telephone cable to the European and American industry.

✦ ✦ ✦

ALUMINUM cables have now replaced copper cables for high power transmission lines in the so-called "moisty" districts of Germany after a further improvement in the quality. Similar replacement is also taking place in Switzerland, Italy and France. In Germany not a single ton of copper cable has been laid since 1935.

(*Please turn to Page 318*)

Exports and Imports of Wire

(*Continued from Page 313*)

feet and $44,395), France (1,216 square feet and $2,801), and Belgium (291 square feet and $441).

✦ ✦ ✦

IMPORTS of WIRE CLOTH AND SCREENING at 79,446 square feet compared with 109,481 square feet and came in from Germany (66,191), Canada (6,680), and the Netherlands (6,575).

✦ ✦ ✦

RECEIPTS of WIRE HEDDLES totaled 1,395,000 pieces (1,103,000 pieces in February) and were supplied by France (500,000), Switzerland (318,000), Japan (300,000), and Germany (277,000).

✦ ✦ ✦

AFTER 3 consecutive months in which there was no trade in WIRE FENCING AND NETTING of the galvanized before weaving grade, a total of 1,541,125 square feet was received from Belgium (1,401,750), and the Netherlands (139,375). Of the galvanized after weaving grade, receipts amounted to 1,113,750 square feet (160,503 square feet in February) and came from Germany (843,750), Belgium (225,000), and the Netherlands (45,000).

✦ ✦ ✦

RECEIPTS of FOURDRINIER AND OTHER PAPER MAKING WIRE at 44,330 square feet compared with 54,949 square feet in February and came from Germany (24,586), Austria (14,355), and France (5,389).

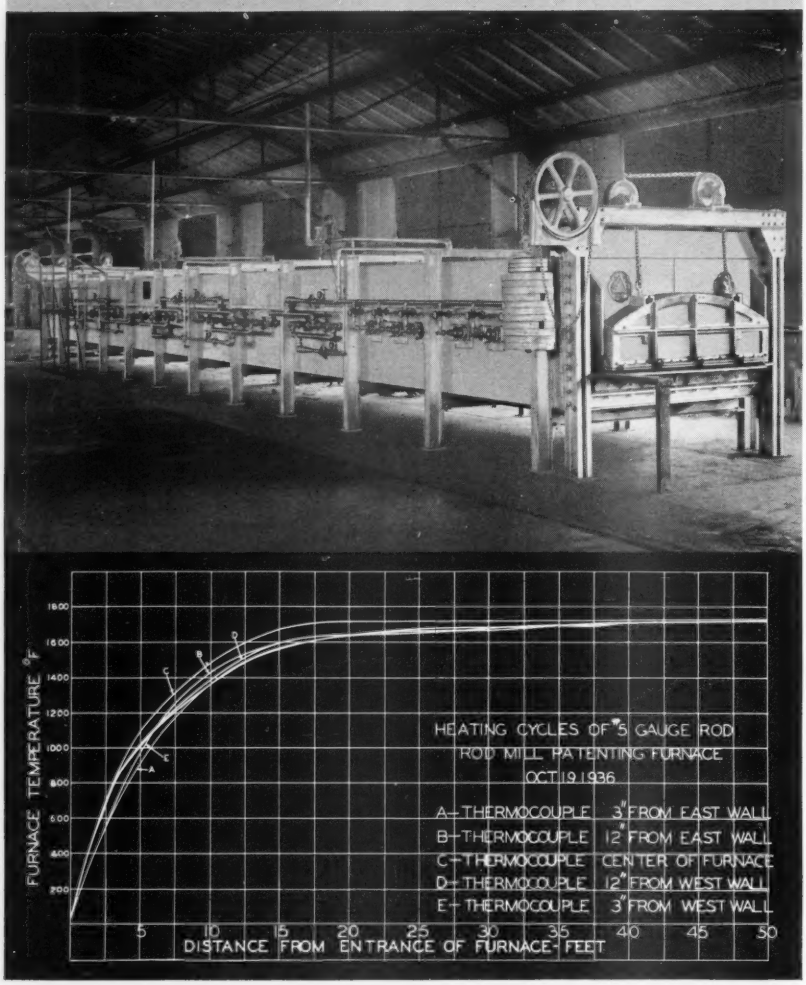
✦ ✦ ✦

EXPORTS of iron and steel wood screws during March, 1937, totaled 93,959 gross valued at $10,842. Of this total Cuba took 32,537 gross valued at $3,236; Philippine Islands 18,085 gross valued at $1,725; Colombia 7,257 gross valued at $772; Mexico 6,521 gross valued at $990; Peru 4,588 gross valued at $631; United Kingdom 3,722 gross valued at $367; Japan 3,695 gross valued at $564.

✦ ✦ ✦

EXPORTS of brass wood screws during the same month totaled 10,779 gross valued at $4,023. Of this total Cuba took 3,278 gross valued at $755; Philippine Islands 1,404 gross valued at $335; Colombia 972 gross valued at $351; Bermuda 862 gross valued at $290; Netherland West Indies 839 gross valued at $495; United Kingdom 706 gross valued at $396.

TYPICAL HEATING CURVE FOR 50-FOOT PATENTING FURNACE



The above graph shows the results of a temperature distribution test conducted by the customer in which five thermocouples were attached to rods (position noted in graph) and passed through the furnace. The uniform temperature distribution is apparent and is typical of the uniformity in all SC gas-fired wire patenting furnaces. Ask SC engineers for detailed information on furnaces for heat treating wire.

SURFACE COMBUSTION CORPORATION . . . Toledo, Ohio.

SURFACE COMBUSTION

Builders of ATMOSPHERE FURNACES and HARDENING, DRAWING, NORMALIZING, ANNEALING FURNACES for CONTINUOUS or BATCH OPERATIONS

'Round the World With the Wire Industry

(*Continued from Page 317*)

DOMESTIC prices for wire products continue to climb up sharply. Only Germany and Italy have left prices unaltered. British prices went up in April by 5 to 8%, Yugoslavia 15 to 20%, Sweden 15 to 20%, Norway 5 to 10%, Holland 7 to 8%, Belgium 8 to 12%, French 8 to 10%, etc. This is the second advance of prices this year. In January prices were advanced by about the same amount and in October 1936 by 8% and 15% according to the markets.

✦ ✦ ✦

CANADIAN wire nails, which have been going into the British market for years are now sold also in Holland, in the Baltic States and Scandinavia. Prices are high, but as the continental industry is unable to accept orders for a reasonable delivery date, many customers turned to this source.

✦ ✦ ✦

Packard Electric Plant to Expand

GENERAL Motors Corporation will expend $400,000 to expand its Packard Electric plant in Warren by constructing a brick building 200 by 400 feet, adding necessary railway sidings and revamping its office, B. N. MacGregor, manager, advises. The company spent $200,000 on the Warren property last Summer. The plant produces automotive ignition cable as its principal product. The addition will be started in 30 days, and will later on involve the employment of additional workers. The property now employs 1,150 workers, three times as many as it did three years ago. In 1920, the Packard company produced 100,000 feet of cable daily, and production is now 2,000,000 feet daily.

✦ ✦ ✦

Republic Steel Corp. New York Export Office

REPUBLIC Steel Corp. announces the removal of its export department to the 13th floor of the Chrysler Bldg., at 42nd St. and Lexington Ave., New York. D. H. Bellamore is general export manager.

Colorado Fuel & Iron Corp. Educating Workers to Understand Current Problems of Industry

IN March of this year the Colorado Fuel and Iron Corp. started a series of free lectures for its employees. These lectures will be free to all steel workers of the plant, but attendance is strictly voluntary. There will be no questions asked those attending and no examinations given. Members will, however, have an opportunity of asking all the questions they like.

✦ ✦ ✦

J. C. Gorham, chairman of the committee arranging the lectures, said:

"The lectures will be given in the hope that hundreds of employees will take advantage of the opportunity to glean information on the common sense and current problems. The project is one of the largest ever attempted by the education committee of the Colorado Fuel and Iron Corporation and inaugurates a new step in educational efforts.

"The subjects to be discussed will embrace many basic phases of economic, governmental, financial and industrial problems and current development in these fields."

✦ ✦ ✦

SUBJECTS for the lectures included: The ABC's of Production, the Nature of Wealth, the Problem of Distribution of Wealth, Labor as a Commodity, Labor as a Co-partner, the Modern Corporation; Taxes, Debits and Their Relation to Production, the Ideal Social Security, Socialism, Fascism, Individualism, the More Abundant Life.

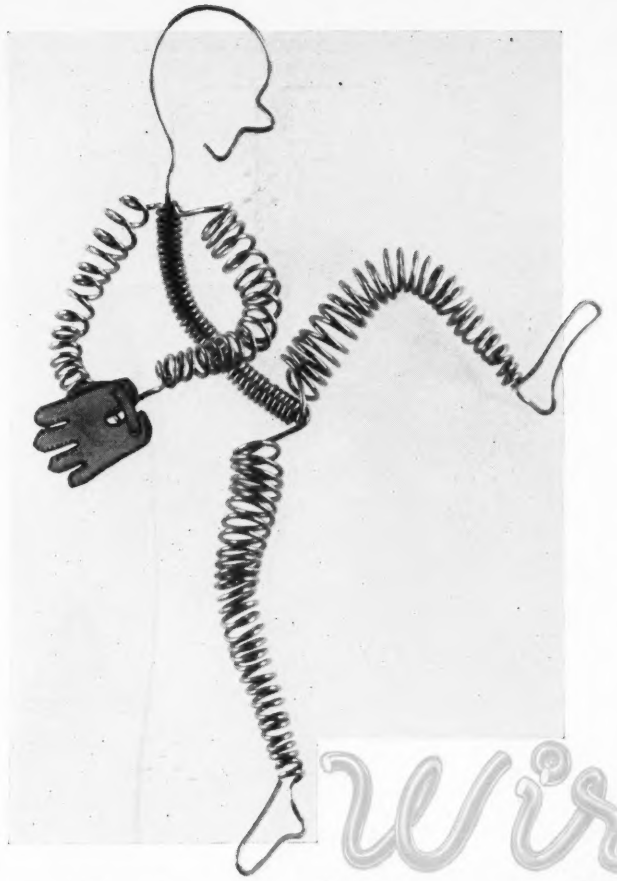
✦ ✦ ✦

Wire Rope Export Association in Germany

EIGHT of the largest German manufacturers of wire rope are reported to have been organized into the "Exportgesellschaft Deutscher Drahtseilwerke m. b. H." at Essen in order to have a common and uniform basis for offers to foreign clients.

✦ ✦ ✦

(*Please turn to Page 320*)



Wire

with Something on the Ball!

Strike out delays, rejections and sluggish production with wire exactly suited to your requirements. Maybe that means one of the many types, sizes and finishes regularly stocked by Keystone. Maybe it means a wire developed to your special order. In either case, you can depend on wire of gratifying uniformity . . . always.

If production costs are high and outside . . . if output is low — maybe you need a different wire on the mound! There's no obligation discussing your problems with Keystone. Write—and the next move is ours.

KEYSTONE

STEEL & WIRE CO. Dept. W., Peoria, Illinois

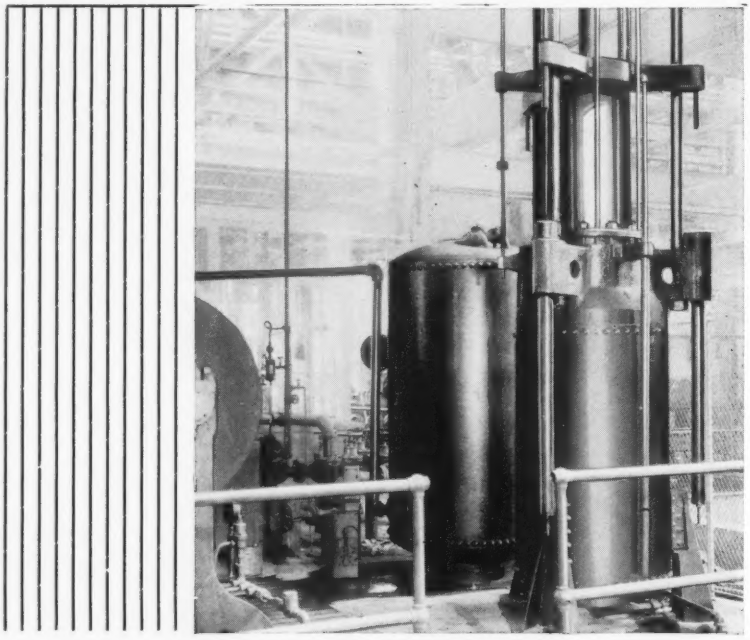
HIGH CARBON or LOW CARBON

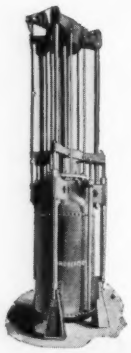
SAMSON SPRING WIRE
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Bright . . Tinned
Coppered
Annealed
Galvanized

MODERN

SPACE SAVING . . . QUICK ACTING
LONG-LIVED . . . VERY EASY TO INSTALL





THE ROBERTSON HYDRO-PNEUMATIC ACCUMULATOR

Far easier to install than most and requiring much less space . . . this thoroughly modern Accumulator utilizes its air tank as a base, requires no special heavy foundation. Equipped with an automatic auxiliary air compressor which maintains pressure in cylinder and storage tanks . . . operating on but 175 lbs. air pressure . . . it will give long, trouble-free service and consistently economical performance.

The Robertson Accumulator shown is for 1500-6000 lbs. hydraulic pressure, and is installed in the plant of John A. Roebling's Sons Co., for many years users of Robertson equipment.

Write for complete construction and performance data. No obligation.

John ROBERTSON CO. INC. *Pioneers~Since 1858*

125-37 Water Street Brooklyn, N. Y.

'Round the World With the Wire Industry

(*Continued from Page 319*)

Galvanized Wire for Fencing Exempted from Customs Duties in Uruguay

UNDER a decree dated March 4, 1937, **Uruguay,** exempted from customs duties galvanized wire for use in construction of fences.

✦ ✦ ✦

Higher German Exports of Bolts, Screws, Rivets and Nails

GERMAN exports of the above-named products are reported to have registered a marked increase in 1936, when compared with the previous year, advises Vice Consul James H. Wright, Cologne. While in 1935 a total of 77,511 metric tons went forward to foreign destinations, shipments in 1936 aggregated 86,545 tons, however, still considerably short of the 127,133 tons shipped in 1929 (the record level. Export prices in 1936 were said to have been below expectations.

✦ ✦ ✦

International Machine Wire Cartel

INABILITY of the **International** Machine Wire Cartel to reach an accord as to the terms on which it may be prolonged beyond April, 1937, is reported by Consul Hugh S. Fullerton, Paris.

✦ ✦ ✦

Duty Free Wire Cloth Into Mexico

COMMERCIAL Attache Thomas H. Lockett, **Mexico** City, advises that "wire cloth of any metal mixtures with 16 to 18 threads to each 2.5 lineal centimeters"—(used in combating malaria) is now imported into Mexico free of duty.

The 1937 Wire Association Meeting Will be Held at Atlantic City, N. J. Oct. 18th to 22nd, 1937

American Steel & Wire Co. to Rehabilitate Cuyahoga Works

(*Continued from Page 305*)

NEW slitting machinery will be added, allowing the mill to operate efficiently with the wider hot rolled sheets which are being produced by the McDonald Works of Carnegie-Illinois Steel Corporation, another United States Steel Corporation subsidiary.

✦ ✦ ✦

THE present strip cleaning and storage department will be centralized and improved, and the building housing this department will be extended by two additions with combined length of 188 feet, and will contain a crane and runway serving the entire length of the extended unit. In addition there will be a continuous cleaner for wider strip and a new tub cleaning unit for heavy gauge coils.

✦ ✦ ✦

ALSO of considerable importance will be the improvement in the annealing department. Seventeen new bell type annealers will be installed for coiled strip which together with improvements on present equipment will make a most modern operation. Two box type annealers of improved design also will be added, as well as a continuous annealing unit complete with payoff reels, electric furnace, atmosphere gas generating equipment, take-up frame and handling facilities.

✦ ✦ ✦

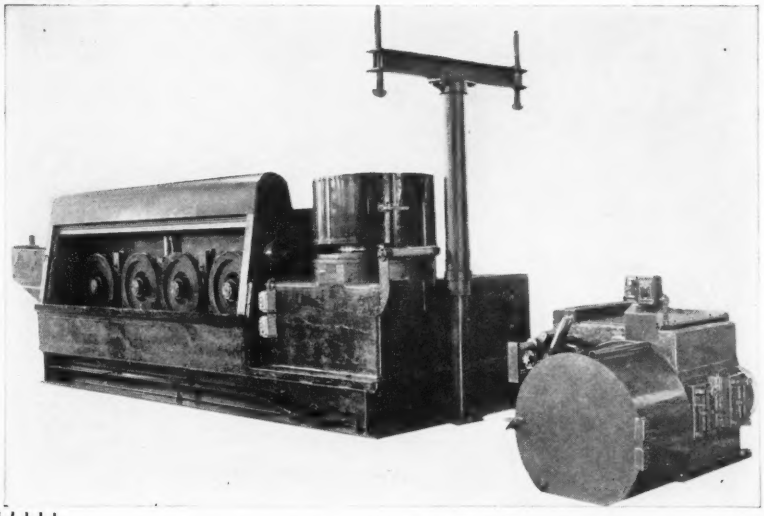
"THE program when completed" said C. F. Hood, Executive Vice President, under whose direction the plans have proceeded, "will allow, through increased speed and flexibility of the rolling machinery, the shorter time of annealing cycles, and the improved handling and shipping facilities, for more accurate and higher quality output, and especially for more prompt attention to small orders.

✦ ✦ ✦

"IT is part of the general program which the American Steel & Wire Company has been carrying on of rehabilitating and modernizing throughout the country. Employment at the Cuyahoga Works," he added "is now at an all-time peak, with more than three thousand men working."

ES

HIGH SPEED WIRE DRAWING EQUIPMENT



Type "F" Heavy Duty Rod Breakdown Machine

This machine can draw copper, bronze or brass.

Maximum size of entering rod	7/16"
Size of finished wire	#2 to #16 B & S gauge
Maximum operating speed	3000 F.P.M.
Number of drawing dies	#7-#9-#11 or #13 (minimum slip)
Number of drawing block shafts	4
Maximum motor size	200 H.P.

A **COMPLETE** line, minimum slip, built primarily for high speed drawing — built for long life, efficient operation, economical production and clean and excellently wound quality wire.

High Speed Insulating Machines For Use With Paper — Cotton — Silk

Saturating and Finishing Equipment For Weatherproof and Code Wire

Taping Machines for Cambric and Paper, etc.

Take-ups — Spoolers — Coilers

Complete Tinning Equipment

Other Equipment for Producing Wire and Cable

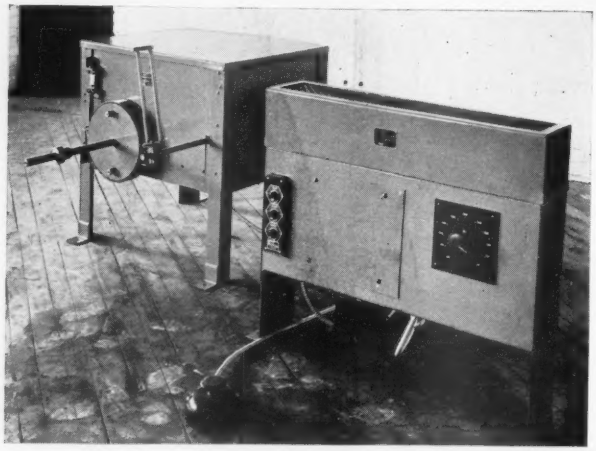
Let us show you what our equipment can do towards cutting production cost and improving quality.

ELEVATOR SUPPLIES COMPANY, Inc.

RAHWAY, N. J.

EXECUTIVE AND SALES OFFICE
420 LEXINGTON AVE., NEW YORK, N. Y.

WORKS
RAHWAY, N. J.



DAVIS AUTOMATIC SPARK TESTER

R. L. DAVIS ELECTRIC COMPANY, INC.
WALLINGFORD, CONN.

EUROPEAN AGENTS
SELSON MACHINE COMPANY
LONDON, ENGLAND

A SELF contained high speed, fully automatic spark tester. A complete unit that automatically locates and stops when a dielectric fault occurs in the insulation.

✦ ✦ ✦

OPERATING and engineering performance gladly furnished on request.

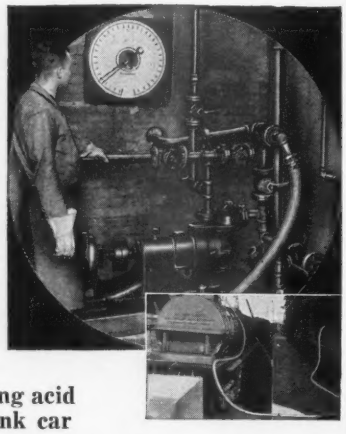
If an Acid tank car should— let go

— then where have you saved?

When you unload acid by the use of a Duriron self-priming centrifugal pump, you don't run the hazard of an explosion with the attendant disaster. You unload through the dome with only atmospheric pressure on the acid.

Duriron Equipment consisting of pumps, valves, pipe and fittings will unload a tank car safely, quickly and economically. Further, it will take the acid from your storage tanks to service or measuring tanks or wherever you want it, one pump doing both jobs.

Remote control switches can be used if desired.



It is more profitable to start unloading acid tank cars before than it is after a tank car has blown up. Can we help you?

THE DURIRON COMPANY, Inc.

445 N. FINDLAY ST. DAYTON, OHIO

Carboloy Film Shows Rapid Grinding Method

SUPPLEMENTING their grinding demonstrations of 1936, Carboloy Company of Detroit recently released a sound slide film showing their new, rapid technique for grinding Carboloy tools. It is reported that up to May 1st, over 2,000 people, representing 170 firms, have seen this film.

✦ ✦ ✦

THE 124 pictures in the film dramatically present the correct and incorrect methods of grinding Carboloy tools and the proper equipment for correct grinding. Not only does this film describe technical details of interest to tool grinding operators but also, due to the broad benefits and economies which are clearly shown, it is of especial interest to production and administrative executives as well.

AFTER the completion of its western schedule of showings, the Carboloy Company will make the film available to Engineering Societies, Foremen's Club, Purchasing Agents' Associations, as well as additional plants interested in obtaining the benefits of this new rapid grinding technique. Requests for this sound slide film may be addressed to Carboloy Company, Inc., 2985 East Jefferson Avenue, Detroit, Michigan.

✦ ✦ ✦

Features of 1937 (Fortieth) A.S.T.M. Annual Meeting, Fourth Exhibit of Testing Apparatus and Related Equipment, June 28-July 2, New York City

DURING the week of June 28-July 2, the 1937 (Fortieth) Annual Meeting of the American Society for Testing Materials will be held at The Waldorf-Astoria, New York City. Throughout the week there will also be in progress the Fourth Exhibit of Testing apparatus and Related Equipment. This will be the second meeting which the A. S. T. M. has held in New York City, the previous one having been there in 1912 during an international congress on testing materials. It is a coincidence that the Society's second meeting in New York City should be held 25 years after the first one.

✦ ✦ ✦

IN order to provide ample time for the presentation and discussion of the large number of papers and reports scheduled, upwards of twenty formula sessions are being developed. Some of these will be devoted entirely to symposiums comprising several groups of papers. Among the groups of papers are a Symposium on Significance of Tests of Coal and Coke, another on Correlation of Laboratory and Service Tests of Paints, and one on Consistency: Critical Discussion of Present-Day Practice in Consistency Measurements. There will be an extensive series of papers on asphalt, and several on water and on cast iron.

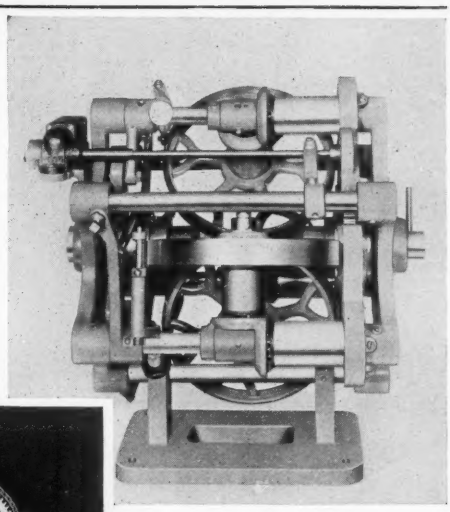
✦ ✦ ✦

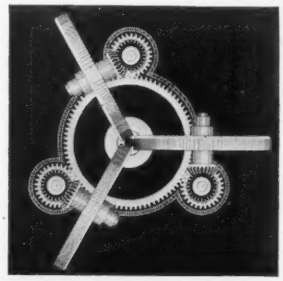
DETAILS of the meeting are being developed by a local committee on arrangements headed by Dr. M. F. Skinker, Assistant Director of Research, Brooklyn Edison Co.

If you want . . . . . .

ACCURATE MEASURE

. . . this is the measuring machine you *must* use. Shows *exact* linear measurement of bare, insulated, twisted pair, oval, odd-shaped, cable. Absolutely accurate at any speed! Speeds up production; saves loss and waste.





EXCLUSIVE "3-V" PRINCIPLE

A patented feature of Lyon Measuring Machine, gives absolute accuracy—permits high speed operation—eliminates vibration, slippage, error.

WRITE!

Inquiries and your fullest investigation invited.

Lyon-Vail *Special Machinery*

BROCKTON · MASSACHUSETTS · U. S. A.

NORBIDE* ABRASIVE . . .

For Efficiently Shaping, Grinding and Polishing Cemented Carbide Wire Drawing Dies.

●

Leaflet giving prices and information sent on request

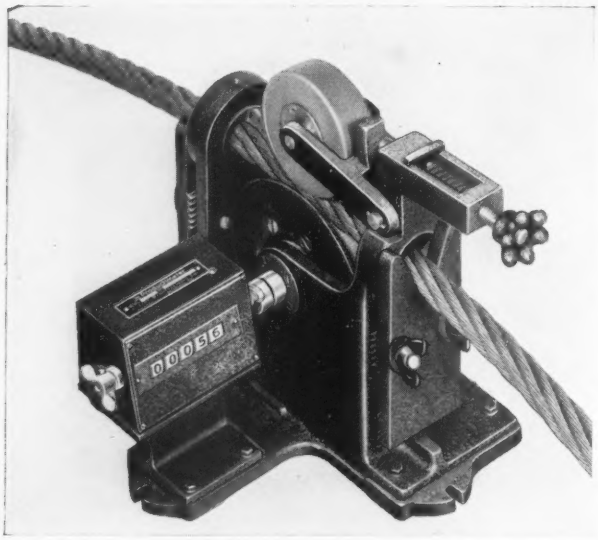
NORTON COMPANY

WORCESTER, MASS.

* Registered trademark for Norton Boron Carbide

Photo courtesy of Master Wire Die Corporation.

NORTON ABRASIVES



A New Heavy Duty Wire Measuring Machine

Productimer L-20 is a fast, accurate, rugged machine for lineal measuring of wire and cable $\frac{3}{16}$ to $1\frac{1}{2}$ in. dia. Maximum speed is over 5000 ft. a minute. Top reading counter is L-21, Compact in size and readily mounted anywhere. Ball bearing throughout. Instantaneous braking.

DURANT MFG. CO.
1928 N. Buffum St., Milwaukee, Wis.
180 Eddy Street, Providence, R. I.

Send for Bulletin 3 on Wire Measuring Machines, including smaller models for bare or insulated wire or cable .005 to .5 in. dia.

WHOEVER UNDERSTANDS GERMAN

Should Read

"Draht-Welt" (Wire World)

A weekly for the wire industry
and related lines.

Subscription price: Rm. 6.50 quarterly

Sample copies free on request from:

Martin Boerner — Verlag
Halle — Saale
Germany

Subcommittee of the A.S.T.M. on Insulated Wire and Cable

THE subcommittee of the American Society for Testing Materials on Insulated Wire and Cable has completed revisions in the Tentative Specifications for Insulated Wire and Cable: Class AO, 30 per cent Hevea Rubber Compound (D 27-36T) and for Insulated Wire and Cable: Performance Rubber Compound (D 353-36T). The table on insulation resistance (Table V) will be extended to cover the same range as the present table on test voltages, namely up to 8000 volts. Minor changes will be made in the electrical tests of multiple conductor cable. The moisture absorption test for braids has been found to be unsatisfactory and will be eliminated from the specifications. The dimensional features, particularly as to cross-section, of the test specimens are to be limited.

✦ ✦ ✦

THIS subcommittee also reviewed a proposed draft of specifications for tough rubber sheath compound for cables. Specification requirements for heat-resisting compound for rubber insulation were also outlined. This subcommittee also considered the first draft of a new set of methods of test for insulated wire and cable whereby the detailed test procedures for the evaluation of such materials will be included in a standard separate from the purchase specifications. These several matters will be given further study.

STEEL WIRE

By MAURICE BONZEL

Translated and Published by
Kenneth B. Lewis
Consulting Engineer

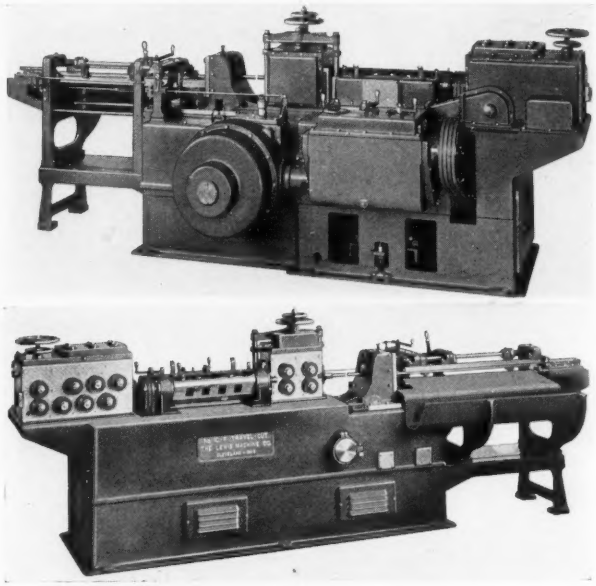
Price $15.00
495 pages. 414 illustrations

SEND ORDERS TO

WIRE and WIRE PRODUCTS
17 E. 42nd Street, New York

Lewis No. 10-F "Travel-Cut" Automatic Wire Straightening and Cutting Machine

THE new No. 10-F Lewis "Travel-Cut" is a modern flying shear automatic wire straightening and cutting machine. It feeds the wire from the coil, straightens, gauges to accurate length and cuts on the fly. This method assures a uniform diameter rod throughout the entire length and produces a rod free of feed roll marks. Although the machine is equipped with an instantaneous acting roll type clutch, the central portion of the forward travel of the head. This permits the wire, after mechanically tripping the clutch, to move forward to the positive length gauge traveling with the cut-off head. Approximately 45° forward motion of the head drive crank are available for gauging the length before the knife strikes the wire. This assures accurate lengths without critical adjustments of any kind.



No. 10-F Travel-Cut-¾" Capacity Automatic Flying Shear Wire Straightening and Cutting Machine.

✦ ✦ ✦ ✦ ✦

the cutting of accurate, uniform lengths does not depend upon accurate engagement of the clutch or brake adjustment, as the machine is so designed that it cuts uniform lengths under all working conditions.

✦ ✦ ✦

THE cut-off die is securely fastened in the traveling cut-off head. This head has vertical ways accurately machined to guide the cut-off knifeholder, and moves forward with the wire during the cutting operation. The cutting knife is operated by means of a quick-action cam on the flywheel shaft similar in design to that used on Lewis standard high-speed cutting machines. By adapting this quick-action cam to a traveling cut-off head, the wire is cut during

THE cut-off head drive is designed to permit very low head construction, the distance from the ways to the center line of the wire being reduced to a minimum. This construction eliminates any tendency to rock at the end of the stroke or produce any uneven wear on the head or bed ways.

✦ ✦ ✦

THE machine is equipped with a roll straightener to remove the coil bow and rough straighten the wire before it enters the rotary straightener arbor or flier. A standard five-die steel rotary straightener is used for the finish straightening operation. This unit is designed to take hardened iron, bronze, babbitt or any type of straightener dies best suited for

(*Please turn to Page 326*)

Dies for
High Speeds
Long bearing Dies
Short bearing Dies
Special bearing Dies
FAMOUS
WIRE DRAWING DIAMOND DIES
VIANNEY
250 E. 43rd St. • New York
Largest Stocks in U.S.A.
Quickest Deliveries
Safest Guarantees
Best Selections
Lowest Costs

We are exhibiting some modern

Scott Testers

In Booth 25

of the A.S.T.M. Exhibition at the Waldorf-Astoria Hotel, New York City

June 28 to July 2

A representative will be in attendance who will be very glad to discuss your testing problems with you.

HENRY L. SCOTT CO.

101 Blackstone St. Providence, R. I.

LEWIS MODERN WIRE STRAIGHTENING AND CUTTING MACHINES

— EQUIPPED WITH —

ANTI-FRICTION BEARINGS THROUGHOUT

Lewis Wire Machines Are Built for Years of Uninterrupted Service — on the Toughest Wire Mill Jobs

Machines for Handling Wire Sizes From 1/32" to 3/4" — Write for Bulletin

THE LEWIS MACHINE COMPANY
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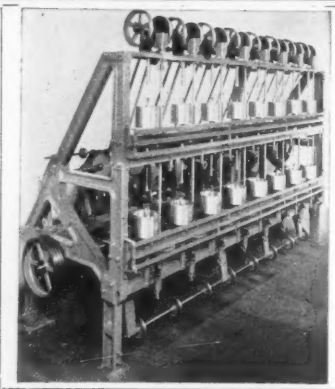

Aimco New Wire Insulating Machine

Simple in construction, high speed production, moderate in price, and costs little to operate. Ball bearings throughout, helical gears, Vee belt spindle drives, minimum floor space.
Versatile—applying cotton, silk, paper, and transparent film such as "Cellophane", with equal facility and at high speeds.
Production figures gladly furnished.

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"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.
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PHILADELPHIA PENNSYLVANIA U.S.A.

NEW ENGLAND BUTT COMPANY
ESTABLISHED 1842
BUILDERS OF
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The All-American Made Diamond Die

Lewis Automatic Straightening and Cutting Machine

(*Continued from Page 325*)

the wire to be handled and is particularly suited for precision work on bright finished steel, bronze, aluminum and alloy wire. The straightener dies are of ample length to provide sufficient end bell for starting the end of the wire through the machine.

✦ ✦ ✦

THIS is the first machine of this size to have all main drive units fully enclosed in oil housings, including the flywheel and clutch which are mounted in a closed housing and run in a constant bath of oil. All the cut-off drive mechanism is completely sealed in the machine bed, and the cut-off cam and cut-off head drive crank run in oil. Forced feed lubrication is provided to the cut-off head ways in the bed. Oil pressure is supplied by a gear type pump driven from the crankshaft. This maintains a film of oil on the bed ways, and floats the cut-off head during its entire stroke. The cut-off head is provided with sliding covers that completely enclose the ways, and seal the entire head drive and cut-off mechanism from wire scale and excessive dust conditions.

✦ ✦ ✦

THE straightener arbor is mounted on ball bearings, and all drive shafts, and feed and straightener shafts are mounted on Timken Roller Bearings.

✦ ✦ ✦

NEW type extension support brackets are mounted on a rigid steel base extending from the machine base the full length of the extension. The wire brackets are constructed to hold the cut lengths away from the machine so that they can be readily removed without interfering with the operation of the machine. A "T" shaped gauge rod fits in a T-slot in the guide bar and is thus supported to the very end without the use of removable clips. The wire feeding through the machine into the guide bar cannot bend or jam this type of gauge rod.

THE machine is driven by "V-Belts" from a double-step pulley on the motor which is mounted in a closed steel base. One set of belts drives the rotary straightener arbor, and another set drives the transmission. All transmission gears are alloy steel, heat-treated and fully enclosed in the transmission housing. Feeds and flywheel speeds best suited to the wire to be straightened and cut are obtained by simply shifting the transmission levers. All sliding gears are mounted on spline shafts.

✦ ✦ ✦

News and Notes of the Spring Industry

(*Continued from Page 301*)

Chatillon Issues New Spring Hand Book

A SPRING hand book dealing with the design and the manufacture of springs has just been released by John Chatillon & Sons of New York, N. Y.

✦ ✦ ✦

THIS hand book consists chiefly of compilation of spring articles recently appearing in this publication and contains spring information of decided usefulness to engineers and draftsmen connected with manufacturing companies that use springs in their products.

✦ ✦ ✦

THE Chatillon Company has manufactured springs for more than a century and in the introduction to the hand book it is stated that during that time, so many facts regarding the design, manufacture and performance of springs have been assembled that it is impossible to include more than a small portion of them between the covers of any volume dealing with the subject. On the other hand the twenty-four pages of this booklet represent a fairly comprehensive survey of the state of the art in its several phases, at the time the material was compiled.,

✦ ✦ ✦

THE booklet will be sent without obligation to any engineer, designer, or purchasing agent who requests it on his business letterhead.

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Samuel Sons Iron & Steel Co., Inc.
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Outstanding Personalities of the Wire Industry

(*Continued from Page 306*)

inghouse at its main works at East Pittsburgh, Pennsylvania, attended night courses at the Carnegie Institute of Technology. Mr. White entered the employ of the Westinghouse Company in 1905 and continued in the main works at East Pittsburgh until 1912. In 1917 he filled the position of Manager of the Central Station and Transportation Division of the Detroit Office.

✦ ✦ ✦

HIS first commission with export was in 1918 when he was assigned to Cuba as Westinghouse Manager with headquarters at Havana. In 1925 he was appointed General Manager of the Westinghouse Company of Japan, later being Managing Director with a staff office at Tokio. In 1931 he was made Managing Director of the Compania Westinghouse Electric Internacional, S. A., in Argentina, with headquarters at Buenos Aires, which position he held until last Fall when he was promoted to General Manager of the Westinghouse Electric International Company and continued in that position until his recent election.

✦ ✦ ✦

Four Appointments Available at Battelle Memorial Institute

FOUR appointments as Research Associate will be available at Battelle Memorial Institute, Columbus, Ohio, for the year 1937-1938. Appointments are for September to August inclusive. These appointments are open to graduates of any accredited university or college. Preference will be given to men who have completed one or more years of graduate study in chemistry, physics, metallurgy, fuel technology or ceramics; or who have demonstrated marked aptitude for scientific research in their industrial experience.

APPOINTMENTS as Research Associate will be for one year's duration, including vacation and may be extended for a second year. The salary will be from $1200 to $1800 a year, depending upon the training and experience of the individual. Research Associates will be expected to devote their entire time to a research project approved by the Director and supervised by members of the Institute staff. Research projects will be of a fundamental or general character looking toward the publication of information that will be useful to science and industry.

✦ ✦ ✦

APPLICATION forms and further information may be secured by writing the Director, Battelle Memorial Institute, Columbus, Ohio.

✦ ✦ ✦

New Tungsten Filament

PERFECTION of a new high-efficiency tungsten filament, which will increase the light output of incandescent lamps 10 per cent without using any additional electrical current was announced recently by J. E. Kewley, vice president of General Electric's incandescent lamp department at Nela Park, Cleveland.

✦ ✦ ✦

THE new high-efficiency filament climaxes 24 years of continuous research in the lamp development laboratories, Mr. Kewley declared, and follows a series of successive improvements in the chemical handling, fabrication, and manufacturing application of tungsten wire.

✦ ✦ ✦

FIRST drawn into a straight wire 19/10,000ths of an inch in diam-

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THE HALLDEN MACHINE COMPANY
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eter, so fine as to be almost invisible to the naked eye, the tungsten is then wound, 335 turns to the inch, around a thin molybdenum wire, or mandrel, leaving the coils, or turns, 1/1000th of an inch apart. These coils must be kept as close together as possible, to reduce heat loss, but must not touch each other, else they would short-circuit, causing the lamp to fail instantly.

✦ ✦ ✦

THEN the coiled wire is coiled once more on another mandrel, 70 turns per inch, with a spacing of 7/1000ths of an inch between the secondary coils. Before the first coiling, the tungsten wire in a filament is 20 inches long. The first coiling compresses it to a length of 3.4 inches. The second coiling compresses it still further to a length of $\frac{5}{8}$ inch, with a coil-diameter of 310/10,000ths of an inch. Following the second coiling, the mandrels or center wires are dissolved by means of chemicals.

✦ ✦ ✦

WHEN installed in the lamp, the new filament is mounted as a cross-bar between two lead-in wires, with one support in the center of the filament, instead of being looped around three supports, as was the practice with the older type of coiled filament.

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New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

BAKERS—Rod and Wire
Lindberg Engineering Co., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Co., Cleveland, O.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CEMENT FLOOR CLEANER—
Magnus Chemical Co., Garwood, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Parkin Co., The Wm., Pittsburgh, Pa.

CLEANERS—Hand and Metal
Magnus Chemical Co., Garwood, N. J.

CLEANING & PICKLING EQUIPMENT
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Farrel-Birmingham Co., Ansonia, Conn.
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Leeds & Northrup Co., Philadelphia, Pa.

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CRANES—Wire Mill
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.
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DIES—Diamond
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
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Rusch Wire Die Corp., New York, N. Y.
Union Wire Die Corp., Stamford, Conn.
Vianney Wire Die Works, New York, N. Y.

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John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York.
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Rusch Wire Die Corp., New York, N. Y.
Union Wire Die Corp., Stamford, Conn.
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Union Wire Die Corp., Stamford, Conn.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
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Vianney Wire Die Works, New York, N. Y.

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Vaughn Machinery Co., Cuyahoga Falls, O.

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Gould, William, New York, N. Y.
Lewis, Kenneth B., New York, N. Y.

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Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works Co., Chicago, Ill.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Machinery Co., Phila.
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila. Pa.
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry and Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Special—Combination Machine for Drawing, Cutting-to-length. Straightening and Reeling Bars from Coil in One Operation (Shumag Type)—
W. A. Schuyler, New York, N. Y.

BUYERS' GUIDE, Continued

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Elevator Supplies Co., Inc., Hoboken, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
Elevator Supplies Co., Inc., Hoboken, N. J.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing Wire
Henry L. Scott Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Elevator Supplies Co., Inc., Hoboken, N. J.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Wrapping Wire
W. A. Schuyler, New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MONORAIL SYSTEMS—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OVENS—Annealing or Drying
Lindberg Engineering Co., Chicago, Ill.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

POTS—Annealing, Case Hardening and Tempering
Lindberg Engineering Co., Chicago, Ill.

POTS—Lead Melting
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

PYROMETERS—
Leeds & Northrup Co., Philadelphia, Pa.

RECORDERS—
Leeds & Northrup Co., Philadelphia, Pa.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Morrison Engineering Co., Cleveland, O.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLS—
Farrel-Birmingham Co., Ansonia, Conn.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SKIN PROTECTOR—
Magnus Chemical Co., Garwood, N. J.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
R. H. Miller Co., Homer, N. Y.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

STRIP—Steel
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TESTERS—Wire
Henry L. Scott Co., Providence, R. I.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Cold Heading
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corp., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Continental Steel Co., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Company, Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Continental Steel Corp., Kokomo, Ind.
Keystone Steel and Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

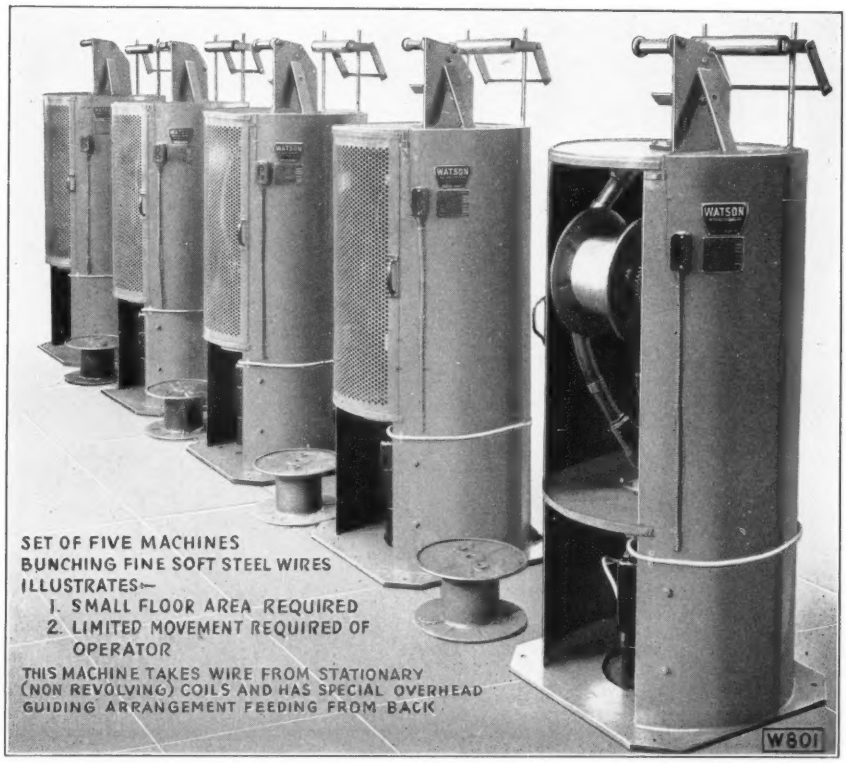
This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ENGINEERS - FOUNDERS - MACHINISTS

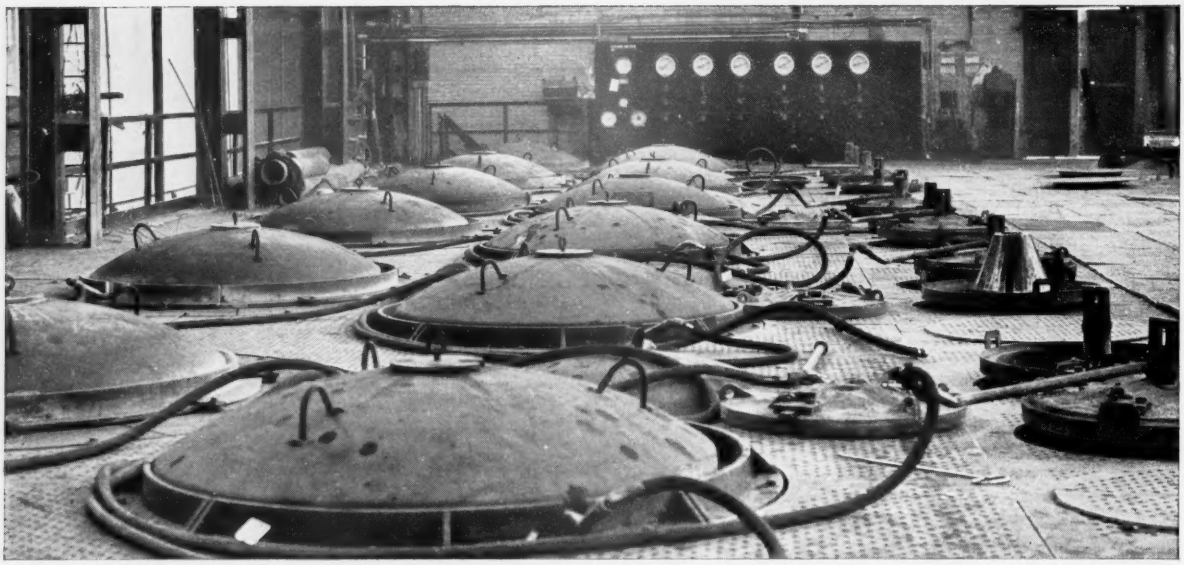

SET OF FIVE MACHINES
BUNCHING FINE SOFT STEEL WIRES
ILLUSTRATES—
1. SMALL FLOOR AREA REQUIRED
2. LIMITED MOVEMENT REQUIRED OF OPERATOR
THIS MACHINE TAKES WIRE FROM STATIONARY (NON REVOLVING) COILS AND HAS SPECIAL OVERHEAD GUIDING ARRANGEMENT FEEDING FROM BACK
WATSON
W801

A modern high capacity installation of five WATSON BUNCHERS V7 for fine wire bunching, for single operator is shown above.

At 1″ lay 42,000 feet of strand is produced hourly.

Small floor area, and automatic electric stops enable single operator to take care of eight machines with ease.

Send for latest bulletin and prices.



6 More PIT TYPE Furnaces

For Annealing Wire and Normalizing Rod

The above installation—another repeat order—is one of several pit type furnace installations recently completed, or now under construction for normalizing rod and bright annealing steel wire.

Recently we have been favored with repeat orders from several of the most prominent rod and wire mills in the country for these pit type annealers and normalizers.

These repeat orders include additional furnaces ranging from one to six per installation. Some are for annealing wire only, some for normalizing and spheroidizing rod and others are to be arranged for handling both rod and wire in the same equipment.

These furnaces are fired with coke oven gas, mixed gases, natural gas or fuel oil.

All are being arranged for use with Elfurno controlled atmosphere because surface condition is becoming so increasingly important.

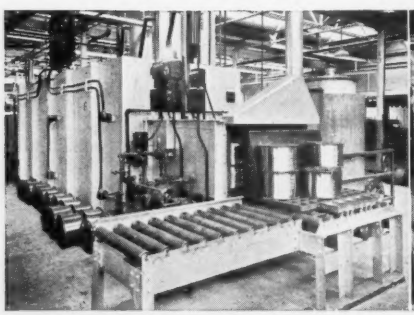
These repeat orders—from users with one and two or more years experience in the operation of the original installation—would seem to indicate that the original furnaces have given satisfactory service and confirm our claim that "these furnaces turn out the most tonnage at the lowest cost with the most satisfactory surface condition obtainable and with the greatest flexibility of operation."

Other recent installations include furnaces for bright annealing copper wire, steel and copper tubing, strip, stampings, clean annealing brass wire, scale free hardening bolts, springs and miscellaneous products, as well as furnaces for billet heating, carburizing, copper brazing and other heating and heat treating processes.

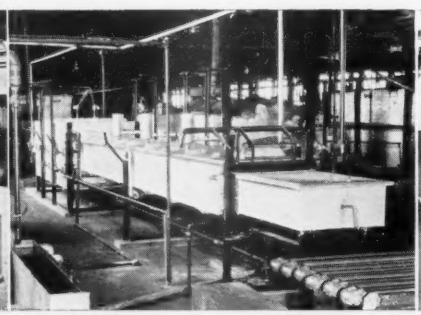
Additional information on these pit type annealers and normalizers or on any other types of furnaces gladly furnished on request.

The Electric Furnace Co., Salem, O.

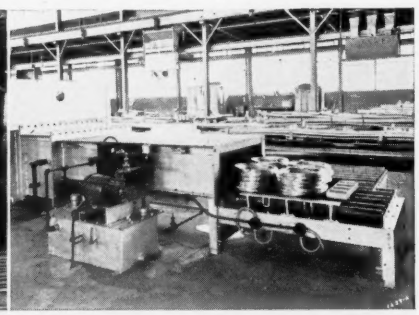
We Build the Furnace to Fit Your Job — For Oil, Gas or Electric Heat.



Bright Annealing copper wire on reels and in coils —continuously.



Bright Annealing fine copper wire on spools — continuously.



Bright Annealing phosphor bronze, brass and nickel-silver wire — continuously.